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AGENCY FOR INTERNATIONAL DEVELOPMENT
UNITED STATES A I D MISSION TO EL SALVADOR
c/o AMERICAN EMBASSY
SAN SALVADOR, EL SALVADOR, C.A

ACTION MEMORANDUM FOR THE MISSION DIRECTOR

FROM: Mary Ott, SO1 Team Leader *Mary Ott*

SUBJECT: Project Assistance Completion Report of the
"Coffee Technology Transfer Project", No 519-0362

DATE October 16, 1998

In accordance with ADS 203 (Managing for Results Monitoring and Evaluating Performance) and USAID/El Salvador Policy (Mission Operation Manual, Chapters 680 and 770), attached is the Project Assistance Completion Report (PACR) for the **Coffee Technology Transfer Project**, which was implemented by Fundacion PROCAFE, No. 519-0362 Project's PACD was September 30, 1997

The PACR summarizes accomplishments of the Project It includes Conclusions and Recommendations

RECOMMENDATION:

That you approve the attached Project Assistance Completion Report

Approved *Jenneth Pelli*

Disapproved

Date *19 November 1998*

ATTACHMENTS

Attachment A Financial Reports
Attachment B IRI's Final Report

Drafted by RCuellar, Activity Manager, SO1 *[Signature]* Date *10/16/98*

Cleared by SGrant, SO1 *[Signature]* Date *10-16-98*
ACMejía, SDO *[Signature]* Date *10-20-98*
FBreen, CONT *[Signature]* Date *11/3/98* *call 10/30*
CJennings, SDO *[Signature]* Date *11/6/98*
LPizarro, OCG *[Signature]* Date *11/10/98*
DMcFarland, DDIR *[Signature]* Date *11/17/98*

PROJECT ASSISTANCE COMPLETION REPORT

PROJECT 519-0362

COFFEE TECHNOLOGY TRANSFER

I- SUMMARY OF THE PROJECT

The United States Agency for International Development (USAID) entered into a Cooperative Agreement with the Salvadoran Coffee Research Foundation (PROCAFE) on July 27, 1992, with a \$12 million Life-of-Project (LOP) funding (USAID contribution) to be expended over a period of five years. On July 23, 1997 the Project authorized funding was reduced to \$10,537,000. PROCAFE counterpart contribution was \$11.250 million. The original Project Assistance Completion Date (PACD) of July 31, 1997, was extended to September 30, 1997 on July 10, 1997.

The Project had four components: 1) Coffee research, 2) Coffee agricultural extension, 3) Economic studies, and 4) Administrative support.

II- GOAL AND PURPOSE OF THE PROJECT

A Goal

The goal of the Project was to revitalize the coffee industry in El Salvador.

B. Purpose

The purpose was to improve per unit yields and overall industry productivity for coffee producers, with an emphasis on small producers.

C PROCAFE's Organizational Structure and Activities

Final authority over the Salvadoran Coffee Research Foundation's activities rested with the General Assembly, composed of member-subscribers, who met at least once a year. The primary responsibility of the General Assembly was to elect the Board of Directors and to approve the annual operating plan. The Board of Directors was responsible for general policy and overall direction of the Foundation. The Board was composed of two representatives from each of the four coffee associations, as well as PROCAFE's General Manager. General administration was carried out by the General Manager, although with heavy guidance and control over daily operations exercised by the Board.

The General Manager was supported by the international technical assistance (TA) team provided by the International Research Institute, Inc (IRI), under contract with USAID. PROCAFE's day-to-day operations were carried out by seven departments:

- a) Technology Generation and Transfer,
- b) Administration and Finance,
- c) Information Services (Computers),
- d) Communications,
- e) Economic Studies and Planning,
- f) Technical Library, and
- g) Geographical Information System (GIS)

PROCAFE's key operating department was Technology Generation and Transfer. This unit was originally organized as two separate departments, but after a general reorganization in July 1995 they were merged into a single unit to improve coordination between research and extension activities.

Technology Generation (research) was carried out by technicians under the direction of a coordinator. Research activities covered the following functions:

- a) Production Systems, with responsibility for coffee farm renovation, soil protection and the recuperation of soil productive capability, environment and crop diversification,
- b) Plant Protection, which promoted integrated pest management techniques to combat numerous pests including the coffee borer,
- c) Analytical Services, which provided laboratory analyses of soils, water and plants, and monitored the quality of agrochemicals, and
- d) Genetics and Quality Improvement which was responsible for developing improved plant varieties, better planting material, and improved methods of coffee processing.

PROCAFE's research effort served coffee producers by providing diagnoses of insect and pest problems and recommended alternatives for their control, seed and planting material of proven genetic quality, and analytical services on soils, water, plants, and agrochemicals. Adaptive research was carried out on 48 demonstration plots located on privately-owned farms and cooperatives in all important coffee growing regions of El Salvador.

Technology transfer (extension) was carried out under the overall direction of a coordinator by approximately 52 extension agents operating from 13 field offices located in three regions covering the entire country. Regional offices were located at Santa Ana, Santa Tecla (Nueva San Salvador) and Santiago de Maria. The field offices were supported by two central departments responsible for technical assistance, validation, and technical training of coffee producers and PROCAFE employees.

The purpose of Technical Assistance and Technology Validation was to convert research results into profitable, "user-friendly" technology recommendations easily applied by coffee producers.

The Training Department provided training to coffee producers and PROCAFE employees as a means of improving producer incomes, with particular attention to small and medium coffee growers

The Communications Department's main role was to strengthen PROCAFE's ties with its constituency. The department developed and implemented publicity campaigns as required to promote specific PROCAFE programs and provided training material for research and extension activities and technical information for the producer.

Economic Studies and Planning supported PROCAFE's research and extension services by developing financial and economic models of different size coffee farms, and by analyzing the cost-benefit effect of recommended agricultural practices. The department served the coffee sector by making annual projections of national coffee production and by carrying out sub-sector analyses as required. This department also maintained information data bases related to coffee production, processing, and exports.

Administration and Finance provided administrative support to PROCAFE in human resources, finance, materials control and general services. The Finance Department was responsible for financial management and control, accounting, financial reporting and the administration of PROCAFE's financial authority policy. Materials and General Services was responsible for materials purchases, inventory control, maintenance of vehicles, buildings and equipment, security and office services. Human resources was responsible for personnel actions including recruitment, salary administration, employee relations and benefits programs.

Information Services was created as a resource base for computer hardware, software, and information systems. This department planned computing resources and was responsible for the acquisition of computer hardware and software.

The "Ing. Félix Choussy" technical library was the only national library in El Salvador specializing in coffee. The library contained technical materials including those produced by ISIC. The library maintained ties to research centers in other countries and will soon have access to international data bases through a satellite network.

The Geographic Information System (GIS) was a powerful information tool which combined data base resources with mapping capability. Mapping of coffee growing areas is based on cadastral information at a scale of 1:5000 and on modern satellite global positioning technology. This Department also monitored water quality in major rivers at a number of run-off locations near coffee processing plants.

III- FINANCIAL STATUS (as of October 15/98)

El No	Element Description	Obligation	Expenditure	Pipeline
01	Tech Assist	\$ 4,965,457	\$ 4 781,909	\$183,548
02	Training	\$ 572,558	\$ 572,558	\$ 0 0
03	Commodities	\$ 3,239,100	\$ 3,239,100	\$ 0 0
04	Construction	\$ 51,037	\$ 51,037	\$ 0 0
05	Operating Costs	\$ 1,621,075	\$ 1,570,220	\$ 50,854
06	Evaluations/ Surveys/Census	\$ 66,738	\$ 66,738	\$ 0 0
07	Audits	\$ 18,977	\$ 18,996	\$ 0 0
08	USAID Admin	\$ 2,037	\$ 2,037	\$ 0 0
	TOTALS	\$10,537,000	\$10,302,598	\$234,401

The \$183,547 under the Technical Assistance line item was de-committed and de-obligated. The \$50,854 under the PROCAFE Operating Costs line item was de-obligated. **Attachment A** shows a detailed financial status report.

IV- PROJECT ACCOMPLISHMENTS

By the end of the Project, it was expected that the following would be achieved:

1) Technology transfer and technical assistance on coffee holdings operated by 15,000 small farmers and 46 agrarian reform cooperatives.

Actual: Technical assistance was delivered to 7,276 small farmers and 110 agrarian reform cooperatives. The total number of assisted coffee growers was 13,571.

2) An average yield of 20 quintales (cwt) per manzana (0.7 hectares) -from 9 quintales of coffee per manzana in 1991- by means of environmentally benign technology packages.

Actual: National average yield by the end of the project was 14.5 quintales per manzana.

For results 1 and 2, the mid-term evaluation provided the following conclusion: "PROCAFE's current goal of assisting 11,000 small farmers between 1993 and 1997 is less than the Project goal of assisting 15,000 small producers over the LOP. The Project

goal is apparently based on erroneous information. At the current rate of progress it is doubtful that even 11,000 small farmers will be adequately served by the end of the Project. Furthermore, the targeted areas of coffee rehabilitation will not likely be met since the decision to rehabilitate is largely dependent on economic factors outside PROCAFE's control."

3) A permanent coffee research and extension capacity within PROCAFE

Actual: A permanent research and extension service is in place within PROCAFE.

Other accomplishments

In addition, PROCAFE reports that new technologies and improved cultural practices were incorporated in 77,723 manzanas, roughly one-third of the total coffee area in El Salvador.

Also, 149 groups of small coffee growers were formed. The groups included 257 women and 1,414 men.

In training directed to coffee growers, 1,470 events were carried out during the life of the project. 34,492 participants attended (surely two or more times by the same participant). Women represented 13% of training participants.

Training was also provided to PROCAFE employees. 227 events took place during LOP, from which 75% were carried out in-country and 25% abroad. Six PROCAFE employees, from which two are women, completed their Masters degrees in Mexico and Puerto Rico.

V- THE I R I CONTRACT

Under the \$12,000,000 Cooperative Agreement, an \$8,655,030 contract was signed between USAID/El Salvador and IRI Research Institute from Stamford, Connecticut. \$3.5 million were destined for commodities and the rest was intended for the provision of international technical assistance.

As mentioned above, international technical assistance (TA) and procurement of major commodities was provided under contract with the IRI Research Institute, Inc. (IRI). The contract began on July 15, 1993 and the Chief of Party arrived in El Salvador one month later. Technical assistance became available a little more than a year after the Cooperative Agreement between USAID and PROCAFE was signed. Under the contract, IRI was to provide a total of 378 person-months of effort by a combination of direct employees, consultants, and subcontractors. Technical assistance to be provided by long term advisors based in El Salvador amounted to 231 person-months, short term technical assistance

(STTA) to be provided by consultants on temporary duty in-country amounts to 112 person-months, and IRI home office support was planned at a level of 35 person-months

The slow delivery of vehicles and computers had a negative impact on PROCAFE's performance, especially in extension activity Clapp and Mayne, a sub-contractor, handled procurement of vehicles and computers, and IRI handled all the rest

The reasons for the procurement delays were a) Buy America regulations, which forced PROCAFE to purchase U S - made vehicles that they felt were poorly suited to local conditions, and made it necessary to apply cumbersome U S procurement regulations, b) USAID's procurement regulations required a lead time of at least six months for delivery of the commodity, and c) inadequate planning by PROCAFE in the face of excessive lead time

Attachment B shows IRI's final report

VI. PROJECT ISSUES

1) On November 16, 1995, the Salvadoran Legislative Assembly approved Decree 508 reducing the dollar check-off contribution to PROCAFE from \$1 00 to \$0 75 per 100 lbs of exported coffee This legislation arose from an agreement made in Colombia by the Minister of Economy, who also serves as President of the Salvadoran Coffee Council, in which El Salvador was to contribute \$930,000 to participate in an international price support agreement The source of funding the Government identified to pay for this Agreement was the dollar check-off, which was the main source for counterpart contribution, and PROCAFE's future sustainability

The issue was finally resolved by the Legislative Assembly by enacting Decree 778 in July 1996, which would reinstate the full dollar check-off to PROCAFE starting in June 1997

2) Under the new USAID/El Salvador strategy, approved in June 1996, for the SO1 Technology/Marketing Results Package, the Project did not "fit" very well The new strategy basically called for strengthening secondary level organizations, formation of cooperatives and/or producer groups, and affiliation of small farmers to primary and secondary level organizations This concept was presented to PROCAFE's board of directors on August 19, 1996

PROCAFE responded on August 27, 1996, in writing, that they could not perform the work of promoting affiliation or formation of cooperatives since that was not their mandate

During October 1996, USAID contracted a consultant, for the purpose of redesigning the Project to make it more "suitable" for the new strategy. The consultant recommended three components: 1) An activity, under a sub-contract, to be implemented by UCAFES (a second level organization), 2) a para-technician component to increase penetration of the extension services, and 3) a pilot plant for research on residual waters from the processing phase.

Under this new concept most of the money was to be directed for component 1, the UCAFES sub-contract, which fitted very well under the SO1 strategy. PROCAFE board of directors did not agree with this approach, but agreed with components 2 and 3, and responded that they would present a counter proposal on December 15, 1996.

On the third week of November 1996, the SO1 office was informed by USAID/Washington of a \$2 million dollar reduction for FY97. One of the Projects that were selected to "pay the bill" was PROCAFE due to: 1) No compatibility with the new USAID/El Salvador strategy, and 2) lack of support from the "gremiales" that compose PROCAFE which surfaced during the \$0.25 dollar check-off reduction.

Therefore, and due to the reasons mentioned above, activities with PROCAFE were suspended during 1996 and the first semester of 1997, with the exception of the financing of six scholars studying abroad and the financing of the IRI contract which ended in July 1996. Activities were re-started until July 1997 to develop a \$146,000, three-month, action plan.

VII. PROJECT EVALUATIONS AND AUDITS

A. Evaluations

Mid-term Evaluation

The evaluation was carried out to review PROCAFE's ability to support coffee research and extension and to estimate the economic effects of project-sponsored technology.

The evaluation was carried out by a three-person team over a four-week period during October-November, 1995. The team was based in the city of San Salvador and traveled extensively throughout the country while visiting coffee farms and processing plants, to interview large producers, small farmers, cooperatives, agribusiness operators, USAID officials, specialists from the technical assistance team provided by the International Research Institute (IRI) and PROCAFE, the implementing organization.

Major conclusions, recommendations and lessons learned from the evaluations were the following

Conclusions

a) Management Issues

PROCAFE's financial position projected over the medium term is relatively strong. As long as the "dolar-café" donation continues at its current level, PROCAFE should be able to provide approximately the same level of service as it now does, after the Coffee Technology Transfer Project ends. However, the lack of assurance over long term funding of the "dolar-café" retention is a dark cloud over PROCAFE's future.

PROCAFE has made good progress toward becoming a capable coffee research and extension organization. Its planning and budget management are highly effective, but the Board of Directors is too deeply involved in the day-to-day activities of the organization.

Although the TA provided by IRI is more costly than levels seen on many USAID projects, on balance it has been effective. USAID is receiving good value for the money spent on technical assistance.

PROCAFE's current goal of assisting 11,000 small farmers between 1993 and 1997 is less than the Project goal of assisting 15,000 small producers over the LOP. The Project goal is apparently based on erroneous information. At the current rate of progress it is doubtful that even 11,000 small farmers would be adequately served by the end of the Project. Furthermore, the targeted areas of coffee rehabilitation will not likely be met since the decision to rehabilitate is largely dependent on economic factors outside PROCAFE's control.

The slow delivery of vehicles and computers has had a negative impact on PROCAFE's performance, particularly in extension activity.

b) Research Issues

Privatization of coffee research has had the following positive effects:

1. PROCAFE management has given priority to solving important problems in the coffee sector. Its mandate is to rapidly and efficiently produce technology that will result in increased productivity and farm income.

2 PROCAFE is developing an effective and efficient administration to support its primary functions technology generation and transfer

3 PROCAFE has incorporated the principal players from the coffee sector into its Board of Directors and Advisory Council, thus providing a forum for private sector participation

4 PROCAFE has attempted to integrate the research and transfer functions to achieve correct solutions to significant problems That integration process is still in progress

The mandate from the PROCAFE Board of Directors is for applied research The metamorphosis from an ISIC to a PROCAFE research methodology is as yet incomplete While the problems which face all coffee producers are generally the same, the solutions are not PROCAFE's research program does not differentiate between the technologies that are appropriate for the low versus high resource producers

The complexity and importance of the environmental aspects of the coffee industry, are not reflected in the research program It is important that PROCAFE quickly define its longer-term activities related to the environment El Salvador faces particularly serious environmental problems due to its high population density, severe dry season and porous volcanic soils and concentration of its coffee processing capacity

Coffee and environmental quality are priority areas of concern for PROCAFE management and largely dependent on post-harvest processing conditions Yet, there is no permanent program that is adequately staffed and funded to address problems in this area

There needs to be a greater integration of economic criteria and analysis into PROCAFE's methodology, both for research and technology transfer

PROCAFE does not monitor and measure the impact on the coffee sector of recommendations that have been adopted Impact is estimated on a subjective basis

In the area of "organic coffee" there is little collaboration between PROCAFE and CLUSA, another USAID-supported effort

c) Technology Transfer Issues

Those currently receiving Technical Assistance from PROCAFE regard the assistance highly, but often indicate that they would like to see even more services forthcoming

The performance measures that PROCAFE uses for technology transfer are based on intermediate level targets and gauge process rather than outcomes

The inability of small producers and agrarian reform cooperatives to obtain access to credit is a serious limitation to the adoption of PROCAFE's recommendations. PROCAFE must develop recommended technology packages for these producers which recognize their needs and delivers appropriate technologies

For cultural reasons, male extensionists are less effective in working with women producers than female extensionists. Therefore, in order to reach a greater number of women farmers, more female extensionists should be used

Recommendations

a) Management Issues

PROCAFE should make a concerted effort with the leaders of the coffee sector to resolve the present uncertainty over its long term funding. Once the industry has developed a common position, the sector should approach the Salvadoran government with a long term financing proposal

PROCAFE should follow through on its plans to contact international donors for possible funding, either from outright donations or from service fees for assisting projects related to the foundation's overall objectives

PROCAFE should propose to USAID a modification of Project outputs to a level considered more attainable. Also, PROCAFE should set outcome targets for the different producer groups, such as improving profitability by a given amount, or increasing productivity to a desired level. Impact should be measured in terms of progress made toward achieving these targets

PROCAFE should authorize the TA team to provide an organizational expert to work on behalf of the Board of Directors to review reporting and control procedures necessary to keep the board informed of PROCAFE's major activities but requiring fewer meetings and less intervention in daily activities

USAID and PROCAFE should explore alternatives to continue TA in specific areas beyond the expiration date of the IRI contract

b) Research Issues

Research should be more focused on actual farm conditions, including the capacity of producers to adopt and manage the technology recommended by PROCAFE and the relevance of the technology to those conditions. Special concern should be given

to the low-resource producer and his ability to adopt coffee and diversification technology

PROCAFE should make use of the modern information management techniques that are available to it to monitor and analyze the impact that its program and recommendations are having on the coffee sector, and utilize this information to adjust and fine tune its program

Economic principles should be brought more fully into the research and extension decision-making process. An environmental research program for the next five years should be presented by CADIEX for approval by the Board of Directors. The research agenda should be reprogrammed to reflect the magnitude of the long-range environmental problems facing El Salvador

Given that the CLUSA projects which support organic coffee production are scheduled to terminate in the near future, PROCAFE should consider incorporating this technology into its extension program

PROCAFE should educate its research technicians on how to use the GIS to help design, implement and evaluate research projects

PROCAFE should establish a "dual career path" personnel policy for research technicians

c) Technology Transfer Issues

The productivity of Technology Transfer Agents should be improved. Suggested alternatives include reducing the administrative burden, more efficient scheduling and to use group leaders to amplify the efforts of extension agents

PROCAFE needs to examine its information reporting system. Consideration could be given to creating databases of agent activities and client characteristics which could be used to satisfy information requests as they occur, rather than to generate reports which could answer questions, should they come up

PROCAFE needs to develop a "graduation plan" for its clients, and particularly for the small producer groups that it is creating

In an attempt to circumvent the credit problem faced by small producers and agrarian reform cooperatives, PROCAFE should consider providing recommendations to these producers which are more responsive to farm conditions (e.g. labor intensive) and which require minimal credit, and/or it should seek to align itself with other programs which can provide the needed credit

PROCAFE should change its hiring policies to actively encourage the employment of female technicians. A gender issues course for PROCAFE's upper and middle managers as relates to women extensionists would also be useful.

USAID Follow-up to Mid-term Recommendations

Immediately after the evaluation, the dollar check-off problem arose. As stated above, most of the activities were suspended for one and a half year and there was no sense in providing follow-up to an activity that was basically paralyzed.

Lessons Learned (taken from mid-term evaluation)

With considerable assistance from the Project, PROCAFE is rapidly evolving into a model of privatized research and extension. However, given the over-riding need for institutional development in the transition from public institution to a private organization, more emphasis should have been given in the project design to the management and organizational development of PROCAFE.

The small producer group methodology has proved successful. This has been an effective method for attracting women participants in the extension program, at about the same rate as women are present in the coffee producing population.

One implementation practice which has proved counterproductive is the near exclusive focus on new small coffee producers as clients. The extension agents focus on recruiting new clients with insufficient consideration for continuing services to established clients. To achieve the unrealistic targets established in the Cooperative Agreement, PROCAFE has adopted a strategy of a rapid turnover of its client base, which is clearly not in the best interest of the coffee sector.

Process indicators may be useful for the day-to-day project management but impact indicators are necessary to determine effectiveness and for informed decision-making as to when technical services can be discontinued.

The potential exists to develop a powerful set of information tools from the databases used in conjunction with GIS activities.

In working with small producers, PROCAFE has learned three important lessons: 1) They have compelling social needs which go well beyond technical recommendations concerning coffee production, 2) the most appropriate strategy for small producers is diversification, which uses coffee as one important component, and 3) these producers have clear difficulties in obtaining credit and in adopting recommendations which require purchased inputs.

B Audits

The Project had three audits performed by Price Waterhouse. Audited periods were June 1992 to December 1993, January 1, 1994 to December 31, 1994, and January 1, 1995 to December 31, 1995. All findings and questionable costs, for each period, were duly closed. For CY1996 and CY1997, two financial reviews were conducted by CONT/USAID. No findings arose from these reviews.

VIII COUNTERPART CONTRIBUTION

PROCAFE reported in the latest quarterly counterpart contribution report, a contribution of \$11,446,489 which was higher than the one required by the Cooperative Agreement (\$11,250,000).

IX- SUSTAINABILITY

PROCAFE is an organization that is fully sustainable, mainly via the dollar check-off mechanism, which contributes with approximately \$3 million per year. In addition, PROCAFE readjusted some of the fees that charged to coffee growers in order to increase their income.

PROCAFE, currently, is operating at full capacity and continues providing research and technical assistance to coffee growers and the industry in general. In addition, PROCAFE bought during the life of the project two coffee farms which serve as research-demonstration centers. PROCAFE also expects to obtain additional income from the operation of these two farms.

X- CONTINUING USAID POST-PROJECT MONITORING RESPONSIBILITIES

None

USAID/EL SALVADOR
PROJECT # 519 0362
AS OF OCTOBER 15, 1998
(FIGURES EXPRESSED IN US \$)

10/16/98

09 16 43 AM

	AMOUNT OBLIGATED BY ELEMENT	TOTAL EXPENDITURES	PIPELINE
I TECHNICAL ASSISTANNC	4,965,457 00	4,781,909 93	183,547 07 *
II TRAINING	572,558 24	572,558 24	0 00
III COMMODITIES	3,239,100 07	3,239,100 07	0 00
IV CONSTRUCTION	51,037 41	51,037 41	0 00
V PROCAFE OPERATING COSTS	1,621,075 29	1,570,220 67	50,854 62 **
VI EVALUATION/B L SURVEY/CENSU	66,738 41	66,738 41	0 00
VII AUDITS	18,996 58	18996 58	0 00
VIII USAID ADMINISTRATION	2,037 00	2037	0 00
TOTAL	\$10,537,000 00	\$10,302,598 31	\$234,401 69

* TO BE DE COMMITTED AND DE OBLIGATED

** TO BE DE-OBLIGATED

14

10/15/98		MXPEMELM		COFFEE TECHNOLOGY TR/ RAFAEL CUELLAR,		Page		15	
Project No	El	Budget Plan	Reserv	Obligation Doc No	Cum Element	Earmark Amount	Unearmarked	Element Name	
No		Code	Ctl No		Amount		Amount		
90362	00	1 LDNX9225519KG13	L200319	CA 5190362A00206600	1,107,000 00	1,107,000 00	0 00	TECHNICAL ASSISTANCE	
90362	00	1 LDNA9225519KG13	M200828	CA 5190362A00206600	1,102,126 00	1,102,126 00	0 00	TECHNICAL ASSISTANCE	
90362	00	1 LDVA9325519KG13	S300517	CA 5190362A00206600	476,837 00	476,837 00	0 00	TECHNICAL ASSISTANCE	
90362	00	1 LDVA9325519KG13	S300748	CA-5190362A00206600	567,281 89	567,281 89	0 00	TECHNICAL ASSISTANCE	
90362	00	1 LDV49425519KG13	S400858	CA 5190362A00206600	492,212 11	492,212 11	0 00	TECHNICAL ASSISTANCE	
90362	00	1 LDV59525519KG13	S501098	CA-5190362A00206600	920,000 00	920,000 00	0 00	TECHNICAL ASSISTANCE	
90362	00	1 LDV69625519KG13	S600428	CA 5190362A00206600	300,000 00	300,000 00	0 00	TECHNICAL ASSISTANCE	
		1			4,965,457 00	4,965,457 00	0 00		
90362	00	2 LDN29225519KG13	M200827	CA 5190362A00206600	100,000 00	100,000 00	0 00	TRAINING	
90362	00	2 LDVA9325519KG13	S300748	CA 5190362A00206600	32,718 11	32,718 11	0 00	TRAINING	
90362	00	2 LDV49425519KG13	S400858	CA 5190362A00206600	215,719 20	215,719 20	0 00	TRAINING	
90362	00	2 LDV59525519KG13	S501098	CA 5190362A00206600	224,120 93	224,120 93	0 00	TRAINING	
		2			572,558 24	572,558 24	0 00		
90362	00	3 LDN29225519KG13	M200827	CA 5190362A00206600	75,004 88	75,004 88	0 00	COMMODITIES	
90362	00	3 LDNA9225519KG13	M200828	CA 5190362A00206600	682,277 85	682,277 85	0 00	COMMODITIES	
90362	00	3 LDVA9325519KG13	S300517	CA 5190362A00206600	589,717 27	589,717 27	0 00	COMMODITIES	
90362	00	3 LDVA9325519KG13	S300748	CA 5190362A00206600	300,000 00	300,000 00	0 00	COMMODITIES	
90362	00	3 LDV49425519KG13	S400858	CA 5190362A00206600	792,068 69	792,068 69	0 00	COMMODITIES	
90362	00	3 LDV59525519KG13	S501053	CA 5190362A00206600	500,000 00	500,000 00	0 00	COMMODITIES	
90362	00	3 LDV59525519KG13	S501098	CA 5190362A00206600	300,031 38	300,031 38	0 00	COMMODITIES	
		3			3,239,100 07	3,239,100 07	0 00		
90362	00	4 LDN29225519KG13	M200827	CA 5190362A00206600	24,995 12	24,995 12	0 00	CONSTRUCTION	
90362	00	4 LDVA9325519KG13	S300517	CA 5190362A00206600	26,042 29	26,042 29	0 00	CONSTRUCTION	
		4			51,037 41	51,037 41	0 00		
90362	00	5 LDNA9225519KG13	M200828	CA 5190362A00206600	1,210,596 15	1,210,596 15	0 00	PROCAFE OPERATING COSTS	
90362	00	5 LDVA9325519KG13	S300517	CA 5190362A00206600	326,668 45	326,668 45	0 00	PROCAFE OPERATING COSTS	
90362	00	5 LDV59525519KG13	S501098	CA 5190362A00206600	83,810 69	32,956 07	50,854 62	PROCAFE OPERATING COSTS	
		5			1,621,075 29	1,570,220 67	50,854 62		
90362	00	6 LDNA9225519KG13	M200828	CA 5190362A00206600	0 00	0 00	0 00	EVALUATION/B L SURVEY/CENSU	
90362	00	6 LDVA9325519KG13	S300517	CA 5190362A00206600	66,738 41	66,738 41	0 00	EVALUATION/B L SURVEY/CENSU	
90362	00	6 LDV59525519KG13	S501098	CA-5190362A00206600	0 00	0 00	0 00	EVALUATION/B L SURVEY/CENSU	
		6			66,738 41	66,738 41	0 00		
90362	00	7 LDNA9225519KG13	M200828	CA 5190362A00206600	5,000 00	5,000 00	0 00	AUDITS	
90362	00	7 LDVA9325519KG13	S300517	CA 5190362A00206600	13,996 58	13,996 58	0 00	AUDITS	
		7			18,996 58	18,996 58	0 00		
90362	00	8 LDV59525519KG13	S501098	CA 5190362A00206600	2,037 00	2,037 00	0 00	USAID ADMINISTRATION	
		8			2,037 00	2,037 00	0 00		
90362	00				10,537,000 00	10,486,145 38	50,854 62		

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BPC	COMMITMENT DOC	Earmark Ctl No	Open Commt Resv	Commitment Amount	Disbursed Amount	Opn Advc Amount	Available Amount	Agent Name	Commitment Descriptn
LDNA9225519KG13	CO 5190362C00317200	R200456	0 00	1,000,000 00	1,000,000 00	0 00	0 00	IRI RESEARCH INST INC	CO IRI RESEARCH INST
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LDNX9225519KG13	CO-5190362C00317200	R201340	0 00	279,874 00	279,874 00	0 00	0 00	IRI RESEARCH INST INC	TRNSFR TO OLD APPR JV 52
LDNA9225519KG13	CO 5190362C00317200	R301341	0 00	102,126 00	102,126 00	0 00	0 00	IRI RESEARCH INST INC	TRNSFR TO OLD APPR JV 52
92			0 00	2,209,126 00	2,209,126 00	0 00	0 00		
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LDVA9325519KG13	CA 5190362A00206600	R300780	0 00	0 00	0 00	0 00	0 00	MISC	COOP AGREE AMEND 3
LDVA9325519KG13	CO-5190362C00317200	R300863	0 00	196,963 00	196,963 00	0 00	0 00	IRI RESEARCH INST INC	AMEND 01 CO IRI
LDVA9325519KG13	CO-5190362C00317200	R300864	0 00	567,281 89	567,281 89	0 00	0 00	IRI RESEARCH INST INC	AMEND 01 CO IRI
LDVA9325519KG13	CO 5190362C00317200	R301332	0 00	279,874 00	279,874 00	0 00	0 00	IRI RESEARCH INST INC	TRNSFR TO CURRENT APPR JV
93			0 00	1,044,118 89	1,044,118 89	0 00	0 00		
LDV49425519KG13	CA 5190362A00206600	R400859	0 00	16,457 00	16,457 00	0 00	0 00	PROCAFE	PROCAFE/ TECH ASSISITC
LDV49425519KG13	CO 5190362C00317200	R401086	0 00	443,037 00	443,037 00	0 00	0 00	IRI RESEARCH INST INC	IRI/CO AS PER AMEND 02
LDV49425519KG13	CO 5190362C00317200	R401186	0 00	32,718 11	32,718 11	0 00	0 00	IRI RESEARCH INST INC	IRI/ TECH ASSIS TO PROCAF
94			0 00	492,212 11	492,212 11	0 00	0 00		
LDV59525519KG13	CA 5190362A00206600	R501098	0 00	0 00	0 00	0 00	0 00	PROCAFE	INC FUNDING AS PER AMEND
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95			0 00	920,000 00	920,000 00	0 00	0 00		
LDV69625519KG13	CO 5190362C00317200	S600219	0 00	300,000 00	116,452 93	0 00	183,547 07	IRI RESEARCH INST INC	IRI/ TECH ASSIS TO PROCAF
96			0 00	300,000 00	116,452 93	0 00	183,547 07		
			0 00	4,965,457 00	4,781,909 93	0 00	183,547 07		
LDN29225519KG13	CA 5190362A00206600	R200450	0 00	73,076 14	73,076 14	0 00	0 00	PROCAFE	TRAINING 07/27/92 07/31/9
LDN29225519KG13	PIL NO 7	R200848	0 00	26,923 86	26,923 86	0 00	0 00	MISC	ACTION PLAN 94 AS PER PIL
92			0 00	100,000 00	100 000 00	0 00	0 00		
DVA9325519KG13	PIL NO 7	S300218	0 00	32,718 11	32,718 11	0 00	0 00	PROCAFE	PROCAFE REPROG/TRAN AD JV
93			0 00	32,718 11	32,718 11	0 00	0 00		
DV49425519KG13	CA 5190362A00206600	R400247	0 00	0 00	0 00	0 00	0 00	PROCAFE	PROCAFE PIL 13 ACTION PLA
DV49425519KG13	CA-5190362A00206600	R400860	0 00	0 00	0 00	0 00	0 00	PROCAFE	AMEND 04
DV49425519KG13	PIL NO 12	R401130	0 00	57,094 88	57,094 88	0 00	0 00	PROCAFE	PIL APPLAN 95
DV49425519KG13	PIL NO 7	R400908	0 00	158,624 32	158 624 32	0 00	0 00	MISC	PIL NO 8 INC ACTION PLAN
94			0 00	215,719 20	215,719 20	0 00	0 00		

Project No 5190362 00

El	BPC	COMMITMENT DOC	Earmark Ctl No	Open Comm Resv	Commitment Amount	Disbursed Amount	Opn Advc Amount	Available Amount	Agent Name	Commitment Descriptn
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2	LDV59525519KG13	PIL NO 12	R501131	0 00	224,120 93	224,120 93	0 00	0 00	PROCAFE	PIL APLAN 95
	95			0 00	224,120 93	224,120 93	0 00	0 00		
2				0 00	572,558 24	572,558 24	0 00	0 00		
3	LDNA9225519KG13	CO-5190362C00317200	R200458	0 00	347,000 00	347,000 00	0 00	0 00	IRI RESEARCH INST INC	CO-IRI RESEARCH INST
3	LDNA9225519KG13	CO-5190362C00317200	R201342	0 00	335,277 85	335,277 85	0 00	0 00	IRI RESEARCH INST INC	TRNSFR TO OLD APPR JV 52
3	LDN29225519KG13	CO-5190362C00317200	R201343	0 00	75,004 88	75,004 88	0 00	0 00	IRI RESEARCH INST INC	TRNSFR TO OLD APPR JV 520
	92			0 00	757,282 73	757,282 73	0 00	0 00		
3	LDVA9325519KG13	CA 5190362A00206600	R300778	0 00	116,415 84	116,415 84	0 00	0 00	MISC	COOP AGREE AMEND 2
3	LDVA9325519KG13	CA 5190362A00206600	R300781	0 00	0 00	0 00	0 00	0 00	MISC	COOP AGREE AMEND 3
3	LDVA9325519KG13	CO-5190362C00317200	R300865	0 00	39,717 27	39,717 27	0 00	0 00	IRI RESEARCH INST INC	AMEND 01 CO IRI
3	LDVA9325519KG13	CO-5190362C00317200	R300885	0 00	300,000 00	300,000 00	0 00	0 00	IRI RESEARCH INST INC	AMEND 01 CO IRI
3	LDVA9325519KG13	PIL NO 12	R301132	0 00	89,609 86	89,609 86	0 00	0 00	PROCAFE	PIL APLAN95
3	LDVA9325519KG13	PIL NO 7	R300849	0 00	343,974 30	343,974 30	0 00	0 00	MISC	ACTION PLAN 94 AS PER PIL
	93			0 00	889,717 27	889,717 27	0 00	0 00		
3	LDV49425519KG13	CA 5190362A00206600	R400861	0 00	37,345 62	37,345 62	0 00	0 00	PROCAFE	PROCAFE / COMMODITIES
3	LDV49425519KG13	CO 5190362C00317200	R401190	0 00	658,727 37	658,727 37	0 00	0 00	IRI RESEARCH INST INC	INCRS CO FUNDS PER AMD #4
3	LDV49425519KG13	PIL NO 12	R401133	0 00	64,995 70	64,995 70	0 00	0 00	PROCAFE	AMEND 01 CO IRI
3	LDV49425519KG13	PIL NO 7	R400909	0 00	31,000 00	31,000 00	0 00	0 00	MISC	PIL NO 8 INC ACTION PLAN
	94			0 00	792,068 69	792,068 69	0 00	0 00		
3	LDV59525519KG13	CA 5190362A00206600	R501053	0 00	0 00	0 00	0 00	0 00	PROCAFE	AMEND NO 7
3	LDV59525519KG13	CA 5190362A00206600	R501100	0 00	31 38	31 38	0 00	0 00	PROCAFE	PROCAFE / COMMODITIES
3	LDV59525519KG13	CO-5190362C00317200	R501087	0 00	500,000 00	500,000 00	0 00	0 00	IRI RESEARCH INST INC	INC CO AS PER CO AMEND 02
3	LDV59525519KG13	CO-5190362C00317200	R501191	0 00	300,000 00	300,000 00	0 00	0 00	IRI RESEARCH INST INC	INCRS CO FUNDS PER AMD #
	95			0 00	800,031 38	800,031 38	0 00	0 00		
3				0 00	3,239,100 07	3,239,100 07	0 00	0 00		
+	LDN29225519KG13	CA 5190362A00206600	R200452	0 00	0 00	0 00	0 00	0 00	PROCAFE	CONSTRUCTION 072792 07319
+	LDN29225519KG13	PIL NO 12	R201134	0 00	2,651 00	2,651 00	0 00	0 00	PROCAFE	PIL APLAN 95
+	LDN29225519KG13	PIL NO 7	R200850	0 00	22,344 12	22,344 12	0 00	0 00	MISC	ACTION PLAN 94 AS PER PIL
	92			0 00	24,995 12	24 995 12	0 00	0 00		
+	LDVA9325519KG13	CA 5190362A00206600	R300779	0 00	0 00	0 00	0 00	0 00	MISC	COOP AGREE AMEND 2
+	LDVA9325519KG13	PIL NO 12	R301135	0 00	6,506 85	6,506 85	0 00	0 00	PROCAFE	PIL APLAN 95

ject No 5190362 00

BPC	COMMITMENT DOC	Earmark Ctl No	Open Comm Resv	Commitment Amount	Disbursed Amount	Opn Advc Amount	Available Amount	Agent Name	Commitment Descriptn
LDVA9325519KG13	PIL NO 12	R301333	0 00	19,535 44	19,535 44	0 00	0 00	PROCAFE	TRNSFR TO CURRENT APPR JV
93			0 00	26,042 29	26,042 29	0 00	0 00		
			0 00	51,037 41	51,037 41	0 00	0 00		
LDNA9225519KG13	CA 5190362A00206600	R200453	0 00	927,942 79	927,942 79	0 00	0 00	PROCAFE	PROCAFE OP COST 072792 07
LDNA9225519KG13	DHL SERVICES	R200548	0 00	114 48	114 48	0 00	0 00	MISC	CREATE COM DOC FOR DHL SE
LDNA9225519KG13	PHONE CALLS & FAXES	R200537	0 00	1,354 35	1,354 35	0 00	0 00	MISC	CREATE COM DOC FOR PHONE
LDNA9225519KG13	PIL NO 12	R201136	0 00	18,810 99	18,810 99	0 00	0 00	PROCAFE	PIL APLAN 95
LDNA9225519KG13	PIL NO 7	R200851	0 00	262,373 54	262,373 54	0 00	0 00	MISC	ACTION PLAN 94 AS PER PIL
92			0 00	1,210,596 15	1,210,596 15	0 00	0 00		
LDVA9325519KG13	CA-5190362A00206600	R301334	0 00	9,218 91	9,218 91	0 00	0 00	PROCAFE	TRNSFR TO CURRENT APPR JV
LDVA9325519KG13	DHL SERVICES	R301335	0 00	0 00	0 00	0 00	0 00	MISC	TRNSFR TO CURRENT APPR JV
LDVA9325519KG13	PHONE CALLS & FAXES	R301336	0 00	0 00	0 00	0 00	0 00	MISC	TRNSFR TO CURRENT APPR JV
LDVA9325519KG13	PIL NO 12	R301337	0 00	317,449 54	317,449 54	0 00	0 00	PROCAFE	TRNSFR TO CURRENT APPR JV
93			0 00	326,668 45	326,668 45	0 00	0 00		
LDV59525519KG13	CA 5190362A00206600	S500332	0 00	32,956 07	32,956 07	0 00	0 00	PROCAFE	PROCAFE/OPERATING COST
95			0 00	32,956 07	32,956 07	0 00	0 00		
			0 00	1,570,220 67	1,570,220 67	0 00	0 00		
LDVA9325519KG13	LAG 4200100305900D013	R301368	0 00	66,738 41	66,738 41	0 00	0 00	AGRIDEC- AGRI DEV CONS	PROCAFE MID TERM EVALUATI
93			0 00	66,738 41	66,738 41	0 00	0 00		
LDV59525519KG13	CA 5190362A00206600	R501101	0 00	0 00	0 00	0 00	0 00	PROCAFE	INC FUNDING AS PER AMEND
LDV59525519KG13	LAG-4200100305900D013	R501369	0 00	0 00	0 00	0 00	0 00	AGRIDEC- AGRI DEV CONS	AGRIDEC MID TERM EVALUATI
95			0 00	0 00	0 00	0 00	0 00		
			0 00	66,738 41	66,738 41	0 00	0 00		
LDNA9225519KG13	CA 5190362A00206600	R200776	0 00	0 00	0 00	0 00	0 00	MISC	COOP AGREE AUDIT EL 07
LDNA9225519KG13	PIL NO 12	R201137	0 00	0 00	0 00	0 00	0 00	PROCAFE	PIL APLAN 95
LDNA9225519KG13	PIL NO 7	R200852	0 00	5,000 00	5,000 00	0 00	0 00	MISC	ACTION PLAN 94 AS PER PIL
92			0 00	5,000 00	5,000 00	0 00	0 00		
LDVA9325519KG13	CA-5190362A00206600	R301338	0 00	0 00	0 00	0 00	0 00	PROCAFE	TRNSFR TO CURRENT APPR JV
LDVA9325519KG13	PIL NO 12	R301339	0 00	9,920 09	9,920 09	0 00	0 00	PROCAFE	TRNSFR TO CURRENT APPR JV
LDVA9325519KG13	PIL NO 7	S300177	0 00	4,076 49	4,076 49	0 00	0 00	PROCAFE	TO COVER AUDIT EXP ACT PL
93			0 00	13,996 58	13,996 58	0 00	0 00		
			0 00	18,996 58	18,996 58	0 00	0 00		

Date 10/16/98

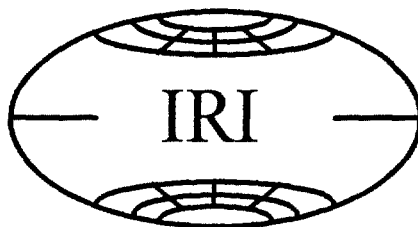
MXCOM Sorted by Fiscal Year Within Element within Project
(MXCOM-NOPROMPT in COMMITMENY MASTER)

Project No 5190362 00

El	BPC	COMMITMENT DOC	Earmark Ctl No	Open Commit Resv	Commitment Amount	Disbursed Amount	Opn Advc Amount	Available Amount	Agent Name	Commitment Descriptn
8	LDV59525519KG13	PO 5190000000610700	S500516	0 00	2,037 00	2,037 00	0 00	0 00	DELL COMPUTER CORP	RCUELLAR' PENTIUM PC&ACCE
	95			0 00	2,037 00	2,037 00	0 00	0 00		
8				0 00	2,037 00	2,037 00	0 00	0 00		
5190362	00			0 00	10,486,145 38	10,302,598 31	0 00	183,547 07		

19

IRI Research Institute, Inc.



COFFEE TECHNOLOGY TRANSFER PROJECT

EL SALVADOR

(Contract No. 519-0362-C-00-3172-00)

FINAL REPORT

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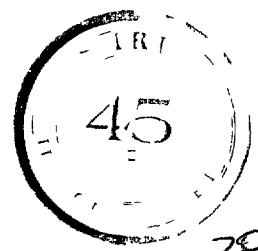


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COFFEE TECHNOLOGY TRANSFER PROJECT

IRI FINAL REPORT

I INTRODUCTION

The United States Agency for International Development Project No 519-0362, Coffee Technology Transfer Project, authorized a donation of US\$12 million in support of the activities of the Fundacion Salvadoreña Para Investigacion Del Cafe -PROCAFE. The Project to be carried out over a period of five years, 1992-97, through a Cooperative Agreement with PROCAFE in which the latter would contribute \$11.25 million. USAID contracted IRI Research Institute, Inc as prime contractor, and Clapp and Mayne as sub-contractor, for a period of 36 months to provide technical assistance and help guide PROCAFE in the initial phase of its operations and to perform the off-shore commodity procurement for the project. The Cooperative Agreement with PROCAFE had been in effect for one year when the IRI Technical Assistance team began its activity, such that the project has completed four years with one year to go at this writing.

The stated goal was to contribute to the revitalization of the coffee industry of El Salvador, which had been badly disrupted during the 12 year internal conflict. In the realization of this goal, it was anticipated there would be created in El Salvador new employment, better income for the coffee producers, an increase in foreign exchange and stimulation to the overall economy of the country.

The funding provided in the Cooperative Agreement by USAID was designated primarily for the purchase of commodities (vehicles, field and laboratory equipment, computers, etc), training, and technical assistance. A minor portion could be used for operational costs and repairs. The major source of operational funds was the "dolar cafe" which comes from the retention of US\$1.00 (one) for each hundred weight of coffee exported by El Salvador. The facilities (buildings, laboratories, vehicles, etc) of the defunct Salvadoran Coffee Institute, ISIC, were to be used by PROCAFE until new equipment was acquired and other facilities arranged.

The purpose of this report is to provide an overview of the status of the Coffee Technology Transfer Project from the standpoint of the Contractor at the termination of the contract, and to outline the more important efforts and accomplishments made to date

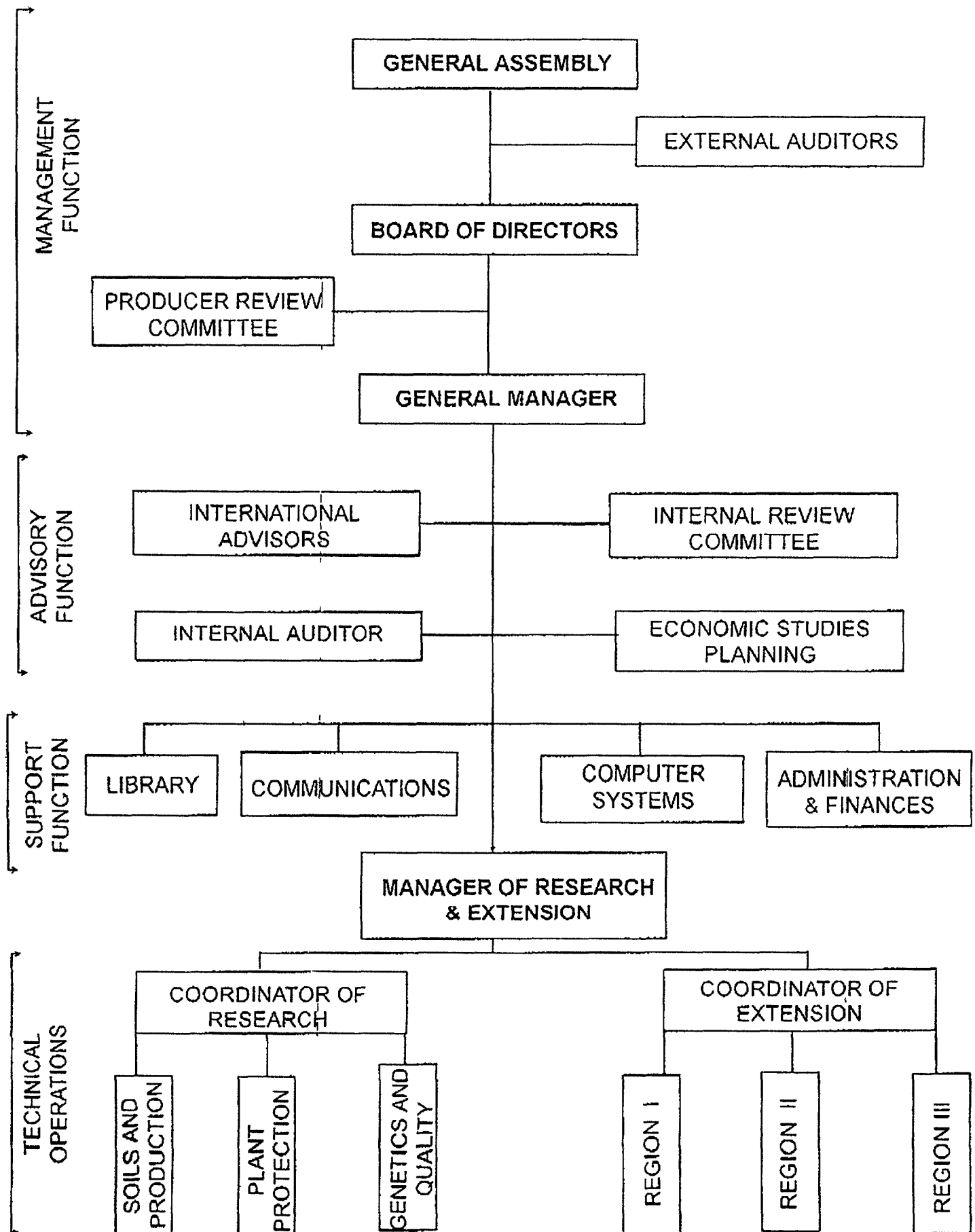
II INSTITUTIONAL ORGANIZATION

At the beginning PROCAFE was, in reality, a privatized government agency, and its structure was essentially an adoption of the traditional form, three divisions - Administration, Research and Extension - each with its typical department subdivisions. It soon became evident that restructuring would be required to avoid a proliferation of positions and to ensure an efficient and cooperative operation. The present structure, demonstrated in Figure 1, emerged with the combining of a number of departments, making one manager responsible for both Research and Extension, and making the Library, Communications and Information Systems all institutional support units. This organizational structure appears to be appropriate for the size and single commodity orientation of PROCAFE.

III PROCAFE BUILDING AND RESEARCH STATIONS

Although PROCAFE purchased a site on the outskirts of El Salvador with intentions of putting the Administrative Unit and Laboratories there, that plan is on hold at the moment. There are some misgivings about the appropriateness of the site, as it is not in the coffee growing area and is located some twenty eight kilometers out of the city where almost all of the employees live. In addition, there is a strong possibility there will be a down-sizing of the PROCAFE staff and programs due to a recent reduction in the funding from the "dollar retention" for exported coffee. Efforts are underway to get full funding restored, if this is successful some adjustments will have to be made.

PROCAFE ORGANIZATIONAL STRUCTURE



Regardless of the final decision about locating the Administrative Unit and Laboratories on this site, it is a valuable resource. It can most surely be re-sold at a price superior to that for which it was purchased.

After much search, a coffee plantation was acquired by PROCAFE to be used for research and extension activities. It is located in the heart of the coffee growing area near Santa Ana, and is representative of a major part of the coffee grown in El Salvador. The fifty two mz (approx 91 A) plantation is large enough to permit PROCAFE to carry out a wide variety of coffee related activities, research, demonstration plots and the production of certified seed of the commercial varieties used in El Salvador, as well as new varieties which prove of value.

An aggressive plan of work has been initiated at the new station for the purpose of establishing a varietal garden, plant nursery facilities, delineation of research areas and demonstration plots, and the overall development of the physical facilities. It is hoped that a training facility for both farmers and technicians might be built some time in the future.

IV. TRAINING AND TECHNICAL ASSISTANCE

The most fundamental contribution made by the Contractor to the Coffee Technology Transfer Project was in the area of training and technical assistance. The training of PROCAFE personnel was done primarily in-country by IRI long-term staff, and by highly specialized short-term consultants. The training provided varied in content from basic concepts, in some cases, to highly specialized sub-disciplines in others, often with the introduction and use of new types of equipment and programs.

The Contractor provided nine long-term Advisors, resident in El Salvador, for periods varying from 12 to 35 months, a total of 245 man/months. The specialties represented by IRI long-term staff were the following:

Administrator/Program Coordinator
 Micro-economist
 Credit Specialist
 Plant Protection Specialist
 Soils and Plant Nutrition Specialist
 Post Harvest/Agroindustry Specialist
 Environmental & Geographic Information Specialist
 Extension Management Specialist
 Procurement Specialist

The short-term consultants represented a wide variety of specialties. Over the three year period, twenty-four individuals were called upon to provide a total of 70 man/months of short-term assistance. Figure 2, lists both long and short-term personnel by name, their specialty area, the department they assisted, and the length of time they were with the project.

In addition to the in-country training provided to PROCAFE staff by the Contractor, opportunities for training outside of El Salvador were also funded by the Cooperative Agreement. Although these funds were not a part of the IRI Contract, it was the responsibility of IRI staff to advise PROCAFE and assist in designing programs, locate appropriate facilities, make contacts and follow the development of the programs. The overseas training provided for six Masters Programs, and a large number of short courses which in some cases were observational, others were on-the-job training, while others were intensive study courses.

IRI/C&M RESIDENT STAFF AND
SHORT TERM CONSULTANTS

NAME	SPECIALTY	DEPARTMENT ASSISTED	TIME OF PARTICIPATION
Paul C Duffield	Chief of Party	Administration	35 0 months
Rafael Grant	Credit	Extension	12 0 months
J R Quezada	Entomology	Plant Protection	34 0 months
Rafael-Ledesma	Extension Admin	Extension	34 5 months
Fernando Caldas	Agro Engineering	Agroindustry	18 7 months
Francisco Artigas	Environmental Protec	Soils & Production	34 5 months
Mario Valderrama	Micro Economics	Economics/Planning	28 0 months
Susumu Ganiko	Procurement	Purchasing	18 0 months
Marcos Pavan	Plant Nutrition	Soils & Production	30 0 months
Awilda Blanco	Information Systems	Administration	4 0 weeks
Duane Mikkelsen	Agronomy	Soils & Production	6 0 weeks
Herculano Medina	Genetics	Genetics & Quality	2 0 months
Larry Nelson	Statistics	Biometry	7 0 months
James Christiansen	Ag Education	Extension	3 0 weeks
Arvel Hunter	Soil Analysis	Soils Laboratory	10 0 weeks
Mauricio Moran	Computation	Econ & Planning	6 0 months
Delbert Myren	Admin Planning	Administration	4 0 weeks
Julia Ledee	Communications	Extension	10 0 weeks
Manuel Pina	Training	Extension	6 0 weeks
Pierce Jones	Elec. Engineering	Information Systems	2 0 weeks
Fedro Zazueta	Computer Science	Information Systems	1 0 week
Alfredo Carrasco	Farm Management	Extension	3 0 weeks
Henry Karczysnki	Agronomy	Production	2 0 weeks
Nerissa Wu	Engineer	Agroindustry	11 0 weeks
Jaime Zuluaga	Engineer	Agroindustry	10 0 weeks
Amador Villacorta	Entomology	Plant Protection	13 0 weeks
Clayton McCoy	Pathology	Plant Protection	2 0 weeks
Peter Engel	Economy	Agroindustry	3 0 weeks
Herman Bruch	Communications	Communications	6 0 months
Ronald Cave	Entomology	Plant Protection	2 0 weeks
Paul Clubine	Interior Design	Administration	10 0 months
Gilberto Vejarano	Sociology	Extension	3 0 weeks
Humberto Serna	Computer Science	Information Systems	12 0 weeks
Luis Tiraboschi	Engineer	Agroindustry	6 0 months
Pedro Kari	Coffee Classification	Genetics	6 0 weeks
German Mejia	Drawing	Communications	11 0 weeks
Wanda del Toro	Technical Writing	Researchers	1 0 week

In general, the overseas training was done in Latin American countries rather than in the United States, primarily because of the limited English capability of PROCAFE staff. In addition, there is no opportunity in the Continental U S to work with coffee production problems, and only limited production of coffee in Puerto Rico and Hawaii.

V EQUIPPING THE INSTITUTION

One of the major benefits PROCAFE derived through the Coffee Technology Transfer Project was equipment for laboratories, vehicles for transportation, communications systems, and field equipment for research and extension activities. The project budgeted approximately US\$3.5 million for this purpose. Although the agreement between the Ministry of Agriculture and PROCAFE permitted the continued use of the former ISIC equipment on a rental basis, most of it was in poor condition or unserviceable.

A significant investment was made in a fleet of vehicles to provide transport for the Extension Service and mobility for the Research and Administrative staff. In view of the type of terrain most commonly used for coffee in El Salvador, the steep slopes of volcanoes, it was imperative that four wheel drive vehicles be purchased. A total of eighty six vehicles which included 32 pickups, 35 jeep type vehicles, 6 station wagon types, one 12 passenger van and 13 motorcycles.

In order that PROCAFE could function as an effective service and research institution, it was necessary to equip the various laboratories required. However, there was considerable delay in initiating the purchase of equipment for laboratories until a firm agreement could be worked out between the Ministry of Agriculture and PROCAFE regarding the use of the ISIC facilities. Once USAID clearance was given to proceed, equipment was purchased promptly for the following laboratories:

Soils and Analytical Laboratories
Plant Protection Laboratories
Genetic and Physiology Laboratories
Post Harvest/Agroindustry Laboratory

Another area of particular importance in developing an efficient and effective organization, and which required substantive equipment procurement, is the area of Communications and Information Systems. The various units formed to provide this capability were

Communications and Library Unit
Administration Information Unit
Geographic Information System
Research and Extension Retrieval and Delivery System

In addition, a considerable amount of tools and individual items were purchased to support the research and extension field activities

VI RESEARCH APPLICABLE TO COFFEE PRODUCTION

Even though PROCAFE has not had an appropriate research station of its own during this startup period, it has carried out a wide gamut of trials using areas loaned by cooperating plantation owners. Some of the more important findings made during this period in the areas of production and soil fertility, plant protection and genetics and quality control are summarized below

a Production and Soil Fertility

It has been possible to quantify the production capacity of the different soils used for coffee production in El Salvador through the field and laboratory studies carried out, so as to more precisely recommend appropriate fertilizer applications to match that capacity. Above all it

has been possible to develop liming and soil amendment programs to overcome the high acidity of the soils which has accumulated because of past fertilization programs. Coffee producers have responded enthusiastically to this program, and have dramatically increased their use of the modern soils laboratory set up at PROCAFE. (The soils lab has a capacity to analyze up to two hundred samples per day)

A number of initiatives are related to reducing production costs, such as the use of mechanical driven augers for making the holes to plant the young trees, planting the seed directly in reusable plastic tubetes which are maintained in a rack isolated from the ground soil (these plants require less soil, less fertilizer, less chemical pesticides and less handling). The use of some fruit producing trees or precious lumber species as shade is also under study, these practices might be most beneficial to small farm coffee producers.

b Plant Protection

This program is concerned with the prevention and control of insects, diseases and weed problems which occur in coffee production. Integrated Pest Management is the philosophy followed in the development of these activities and the use of chemical pesticides is minimized where ever possible. The most intensive effort of this program is to control the coffee berry borer.

The coffee berry borer, *Hypothenemus hampei*, is considered to be the most economically damaging pest in the production of coffee. In El Salvador, 80% of the coffee area is infested with this pest and approximately 50,000 mz (87,500 A) suffer heavy losses annually from the insect. Although the damage caused can be much reduced with use of selected insecticides, this is both costly and undesirable because of the environmental impact.

The tiny wasp, *Cephalonomia stephanoderis*, was introduced into El Salvador in 1990 as a biological control agent. However, to be highly effective, the wasp (a parasitoid) must be mass produced in laboratories and released in the plantations at appropriate times. Since the wasp is

highly specific to the coffee berry borer on which it feeds and lays its eggs, it is necessary to have a plentiful supply of the borer in order to mass produce the wasp. Typically, the borer is collected in the field and brought to the laboratory for the purpose of producing the wasp, the collection of these infested berries is very time consuming and costly, and even more important, at certain critical periods of the year the fresh berries are not available.

It is possible to conserve parchment coffee in a way that it will be accepted in a limited way by the berry borer for feeding and breeding, but a more desirable and readily available medium was needed as a substitute for the fresh berry. Such a medium, an artificial diet, has now been developed at PROCAFE. This medium, when precisely made with the prescribed ingredients and properly maintained is readily accepted by the coffee berry borer for feeding and breeding. The cost per thousand parasitoids when using the fresh infested berries supplemented with parchment coffee is about US\$20, it is believed the cost using the artificial diet can be reduced to no more than US\$5 per thousand parasitoids.

Since the introduction of *C. stephanoderis* into El Salvador in 1990, some 16 million parasitoids have been released in Salvadoran coffee plantations. Eight million of them were released in 1995. There has been a notable decrease in the use of insecticides by coffee farmers during the past two seasons. With the introduction of this new technology to increase the production of this biological control agent at a lower cost, the Salvadoran coffee growers will be much benefited.

There are a number of other important pest problems receiving attention by the Plant Protection Program, such as the soil fungus, *Rosellum* sp., and a complex of soil insects which feed on the roots of both the coffee plants and the shade trees. The coffee rust fungus and the soil nematode problems are being worked on jointly with the Genetics program, as there are promising possibilities of controlling these pests with genetic resistance.

Weed control problems are likewise under study, and it has been shown that the timing of eliminating weed competition can influence yield greatly, controlling the weeds during the dry

season while encouraging vegetative cover during the wet season was much superior to clean cultivation year around, as well as the reverse order of weeding. The use of the perennial peanut, *Arachis pinto*, as a live ground cover shows promise.

c Genetics and Quality Control Program

A major effort is under way to provide root stock material which is resistant to nematodes, adapted to the varying soils and altitudes where coffee is planted, and on to which the commercial varieties of *Coffea arabica* can be grafted. Suitable selections are being found in the species *C. canephora* and *C. liberica*. Both of these species are open pollinated, thus it is necessary to develop clonal lines to ensure the selected quantities are maintained. Field trials with these lines have shown distinct advantages of vigor and yield, particularly where nematodes are a problem. Although hybrid varieties with resistance to the coffee leaf rust are now available, these have some problems with quality and yield, and efforts are continuing to overcome such deficiencies. At the same time, there is an ongoing search for new varieties which yield more or have special qualities which will be attractive to the coffee consumer.

The quality of the coffee bean that goes to market depends much on post harvest handling and processing. It is, also, during this phase of coffee production that the major environmental impacts of coffee production occur. The "wet process" accepted as the form which produces the superior cup of coffee, typically uses large quantities of water which at completion of the process is highly polluted. A number of recommendations for reducing the amount of water used and methods of handling the residual waters have been developed. These include the elimination or reduction of water to transport the coffee berry through the process, and the use of a mechanical means of removing the mucilage, rather than the fermentation process. More careful management and utilization of the pulp and concentrated mucilage could provide economic returns while reducing environmental degradation.

Models of "ecological" processing systems have been developed by PROCAFE. Now, they have a place where such a processing plant can be built to demonstrate its function and the

benefits derived. This is an area that deserves special attention. Pressure is building on both sides inside El Salvador and in consumer countries to both conserve the ecological benefits of the shade grown coffee plantations, and to eliminate the environmental degradation caused by certain phases of processing coffee. Hopefully, PROCAFE will receive the support it needs to move forward aggressively on this program.

VII TRANSFER OF TECHNOLOGY (EXTENSION SERVICE)

The ultimate objective of the USAID Project No. 519-0362 is to assist PROCAFE to develop the capacity to transfer superior technology to the coffee producers in El Salvador, so that they can produce in a manner that provides them with an economic return, and can be competitive with coffee producers elsewhere. The PROCAFE Extension Service is the organization with the primary responsibility to carry out that mission; they are particularly responsible for reaching the small and less well prepared farmers. The larger farmers, and those with more resources, are often inclined to by-pass the Extension Service, thus complicating at times, the roles mandated between Researchers and Extensionists.

When PROCAFE was created in 1992, the ISIC Extension Service was essentially non-functional. It was necessary to select new personnel, train and equip them. This was done in phases as resources and equipment could be provided. Since the procurement process of large ticket commodities using U.S. Government funds is lengthy, the PROCAFE Extension effort was initiated with a few dilapidated jeeps and a half dozen rented 4-wheel drive vehicles. It was May 1994, before the new vehicles were put into service.

Today, with forty five field agents working out of seventeen offices, it is estimated that 60% of the total coffee area is positively influenced by the services of PROCAFE. The recommendations made to farmers are based on diagnoses of the field situations that exist. In cases where the plants are a variety not appropriate for the area, or of an age or condition they are difficult to recuperate, a total renovation is recommended, in others only a partial renovation may be advisable. However, more often it is a matter of introducing a package of improved practices.

related to pruning coffee and shade trees, correct fertilization and the control of insects, diseases and weeds. Coffee is a perennial crop, and introduced changes will only show their effects gradually over time. Planting new varieties, replacing lost trees, use of soil amendments, new systems of pruning, all take several years to produce anticipated results. Even so, there are already measurable effects in yield, vigor, and a notable reduction in the soil acidity of soil samples coming to the PROCAFE Soil Laboratory for analysis by the end of 1995.

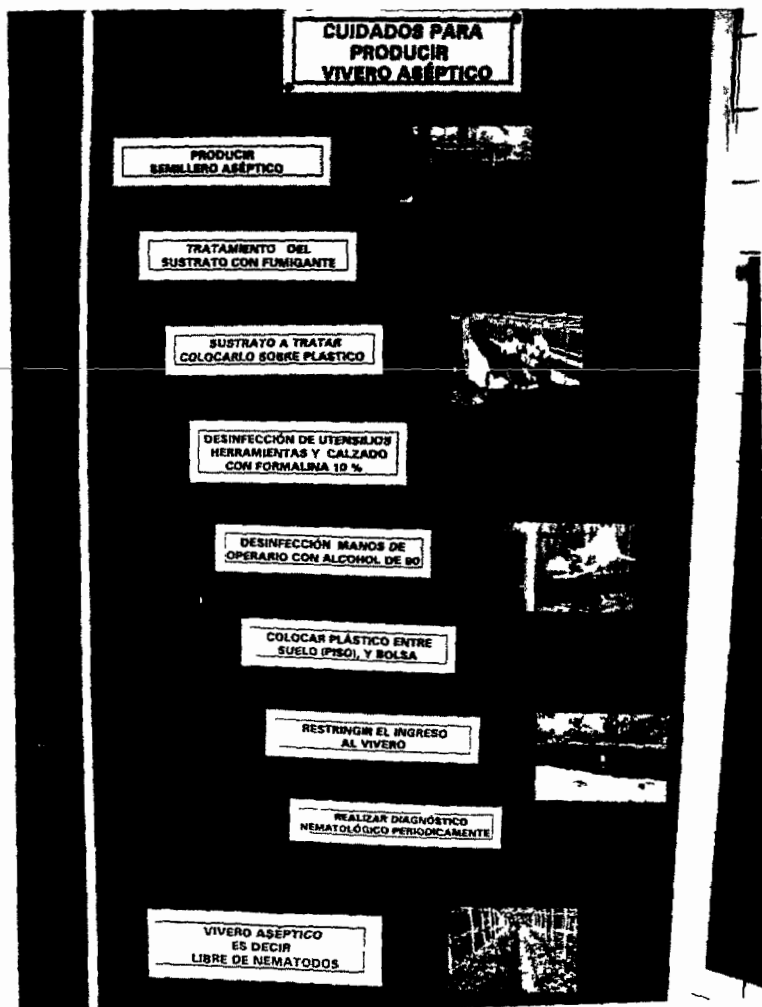
Reaching the small farmer requires “hands on” programs and special techniques. To do this on an individual farmer basis is cost prohibitive. PROCAFE is using training schools where the producers are invited to attend demonstrations of improved technologies. Secondly, it is forming small farmer groups where the agents work with the farmers in a community effort to produce their own trees needed to repopulate their fields and to demonstrate the proper methods of fertilization and care of the plants. These small farmer groups (118 by 1995) work with great enthusiasm (they have produced more than one million trees to add to their plantations in two years), and many look forward to extending their activity to community improvements, etc. Hopefully, these groupings can be further expanded, and will not only continue to receive assistance from PROCAFE, but will find support from other community development organizations.



The PROCAFE goal of revitalizing the coffee industry is being accomplished by assisting the coffee growers with technical assistance, training courses and specialized services such as soil analyses and providing improved certified seed



The above "Feria Educativa" is part of PROCAFE's program to improve the production practices of the small and medium size growers. A different series of lectures were given in each of the tents shown above.



In addition to providing improved seeds, PROCAFE has provided training on the proper sanitation procedures to be followed in the nurseries to prevent the transmission of soil borne pests such as nematodes



Training in soil conservation and proper environmental protection procedures has been part of the PROCAFE program. This includes a major emphasis on liming and efficient use of fertilizers



Training in micro-grafting techniques for coffee has been provided to cooperatives for the commercial production of nematode resistant plants. In the above photo a superior selection of Bourbon coffee is being grafted on to a nematode resistant Robusta variety.



Plastic wrapping is applied to hold the Bourbon scion on to the Robusta root stock until the graft grows together in the nursery. From the nursery the grafted plants are transferred to the field.

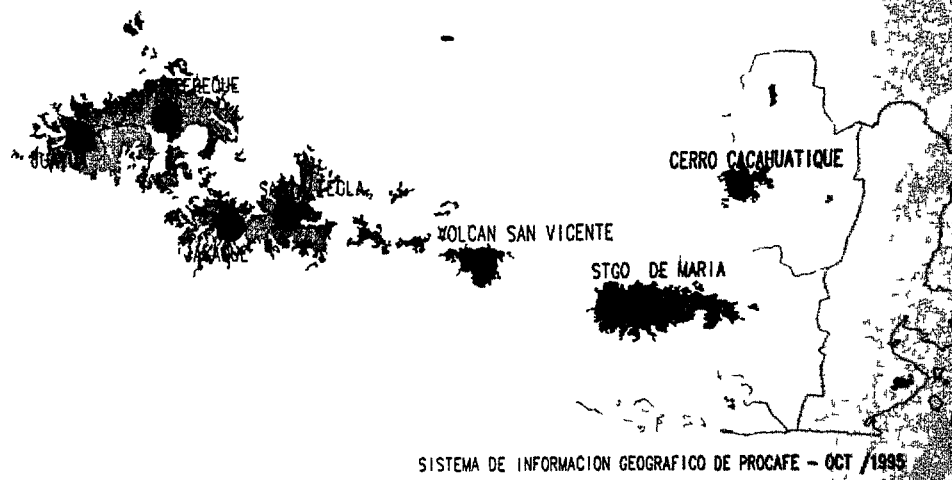


Equipment, supplies and training was provided to improve the Soils and Plant Analytical Laboratory under USAID funding. As a result of the improved facilities and technical assistance provided by IRI there has been a substantial increase in demand for these services. In 1995 more than 10,000 soil samples and nearly 1,000 leaf samples were analyzed. This resulted in more than 100,000 individual determinations for pH, organic matter, soil texture, phosphorus, potassium, calcium, magnesium, aluminum and micro nutrients in some cases.

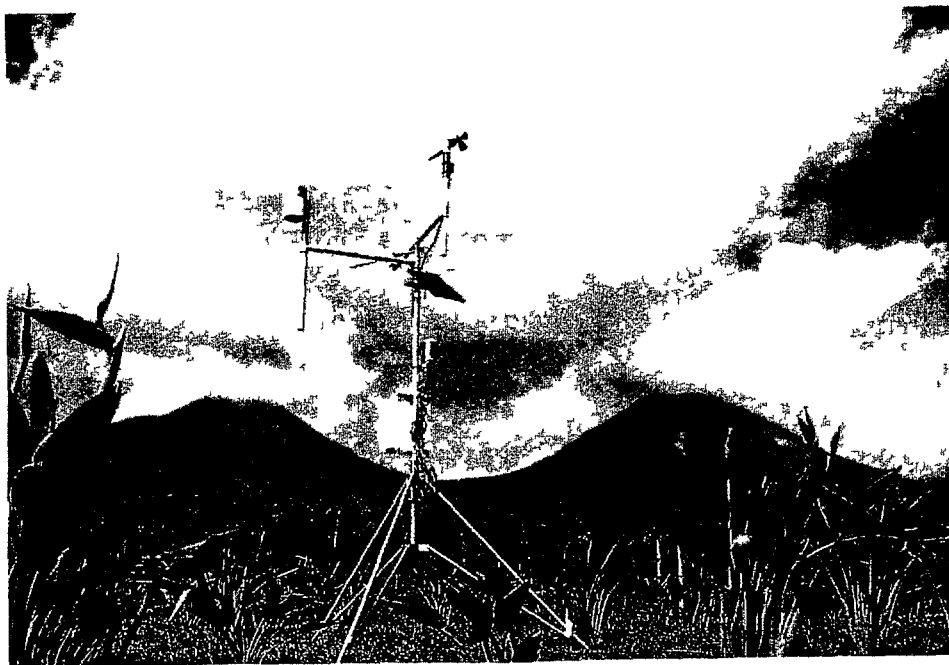


Equipment and training was provided to establish a Geographic Information Systems Laboratory. This group has developed an extensive database on coffee growing areas, administrative boundaries, the environment and other factors. The recent addition of Global Position System equipment make it possible to trace coffee plantation boundaries and perform other cadastral services.

ESTACIONES METEOROLOGICAS AUTOMATICAS EN ZONAS CAFETALERAS



The USAID funding provided the equipment for seven remote automatic weather stations in the coffee growing areas. The Geographic Information System Laboratory developed the above map of the coffee growing areas.



The remote weather stations illustrated above are connected by cellular telephone technology to a central information processing center. Data include temperatures, rainfall, wind velocity and direction, solar radiation, relative humidity and other factors.



A total of eighty six vehicles (mostly 4-wheel drive) were purchased with USAID funding for the project. This included 32 pick-ups, 35 Jeep type vehicles, 6 station wagon types, one 12-passenger van and 13 motorcycles. These were required by the extension specialists and research specialist to get into the fields and to make contact with the growers.



The coffee berry borer is the most important economic pest of coffee. As illustrated above the damage can be severe. A tiny wasp (*Cephalonomia stephanoderis*) was introduced to control this berry borer on a biological basis. New technology was introduced to increase the production of this wasp and about eight million of these parasitoids were released in 1995.



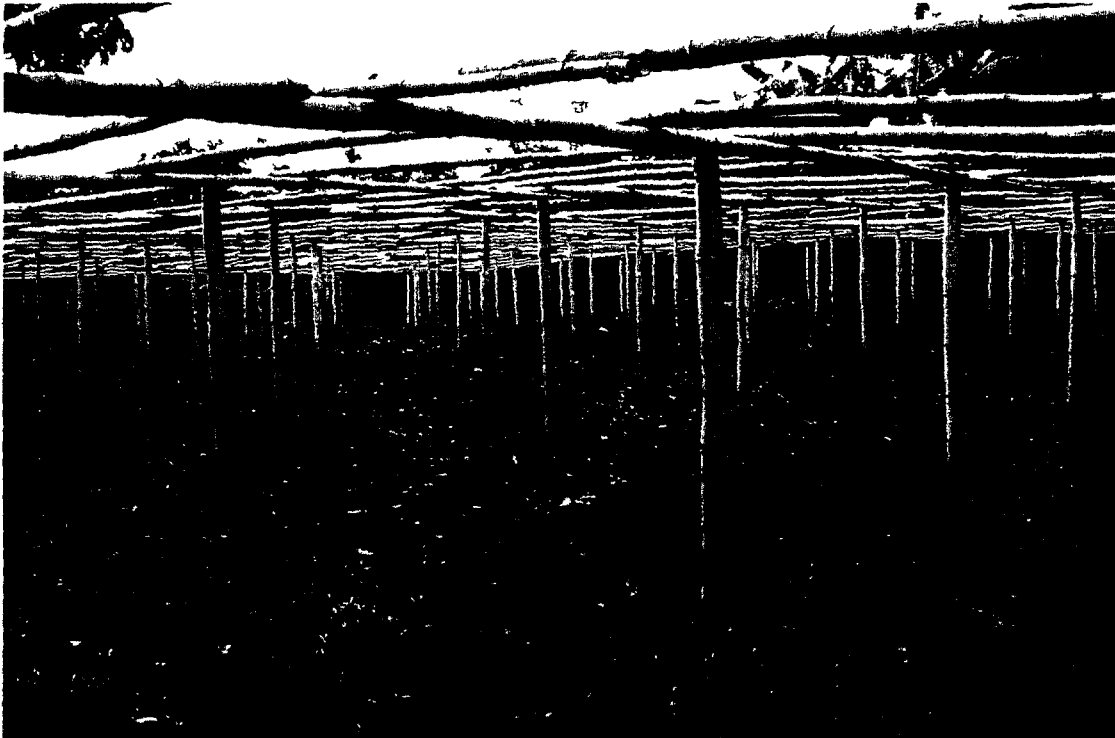
The traditional weed control method is by machete as illustrated above. The use of herbicides and cover crops are being tested as alternatives.



A cover crop *Arachis pinatoi* is being tested as part of agronomic studies on cultural practices that might reduce costs and improve production.



An area (approx 90 ac) was recently purchased and is being developed as a new coffee field research station. This will be used for research and demonstration plots as well as for the production of certified coffee seeds.



Coffee nursery area being developed at the new coffee field station near Santa Ana. Hopefully, training facilities for both farmers and technicians will be built sometime in the future.

VIII OTHER DIRECT SUPPORT ACTIVITIES FOR COFFEE PRODUCERS

In addition to the technical assistance provided to coffee producers by the Extension Service, PROCAFE provides a wide range of other direct support activities through its soils and analytical laboratory, diagnostic laboratories, coffee berry borer biological control labs, GIS laboratory, meteorological stations, and technical and educational publications

a) The Soils and Analytical Laboratory analyzed more than 10,000 soil samples and nearly 1,000 leaf samples for coffee farmers in 1995. Each sample was analyzed for texture, pH, phosphorus, potassium, calcium, magnesium, aluminum, total acidity, and organic material (in some cases additional elements were included). This represented more than 100,000 individual tests. The farmer paid barely one third the actual cost which is approximately 10% of that charged by commercial laboratories for the same analysis.

b) PROCAFE also provides a diagnostic service to determine the causal agents of plant disease, insect, nematode and weed problems the farmers encounter. Once the cause is determined, written alternative recommendations are provided without cost. During the year 1995, seven hundred sixty eight diagnoses were made, 317 for nematodes, 303 for diseases, 44 for insects and 104 for other problems.

c) The Biological Control Program against the coffee berry borer maintains six laboratories for the production of the parasitoid wasp, *Cephalonomia stephanoderis*. At the same time, it assists Artisan laboratories maintained by individuals and cooperatives by providing them with technical assistance, basic equipment and start-up wasps. Fifty two of these artisan labs were functioning in 1995. They produced 6.6 million parasitoids.

d) The Geographic Information Systems Laboratory provides important services to the PROCAFE Research and Extension Divisions, as well as, directly to the coffee growers themselves. It has developed an extensive data base of the coffee growing areas, administrative boundaries, road and hydrological networks, coffee processing facilities and towns and villages in

the areas. With the recent addition of the Global Positioning System, it is now possible to trace plantation boundaries and accurately determine land areas.

e) A National Coffee Weather Monitoring System has been set up with seven remote operated stations feeding data every day into the PROCAFE Central Information System. The information from this System is available on call to all interested parties. The data is summarized and published monthly. As this accumulates it will be extremely valuable in interpreting research results and explaining annual fluctuations in overall production.

f) The only source of genetically certified coffee planting seed in El Salvador is through PROCAFE. During the 1994-1995 cycle, 15,132 lbs. of certified seed were harvested, prepared and sold to interested parties. The seed was produced in areas maintained as "seed banks" of five commercial varieties; it is anticipated this should produce approximately twenty million plants for transplant into the field. In addition, PROCAFE produced in its seed beds 1,482,000 seedlings ready for planting into nurseries.

g) A series of Technical Bulletins and Extension Leaflets covering the various aspects of coffee culture have been prepared, others are in process. A Coffee Production Handbook is soon to be published.

IX OBSERVATIONS AND RECOMMENDATIONS

PROCAFE has evolved very satisfactorily over the past four years, and is now providing a high quality service to the El Salvador Coffee Sector. It has a capable staff of Researchers, Extensionists and Administrators, and it has been supplied with the best equipment available. Even with all of this, PROCAFE's future hardly seems secure. As yet, it has no permanent residence, and the law that provides for its operational funds is annually in question.

The insecure situation of PROCAFE seems strange viewed from the outside, considering the importance of the Institution to the well being of the coffee sector, and the political force of

those within the sector Unfortunately, personal grievances between individuals often take precedence over the well being of the group

Assuming the problems alluded to above are overcome, and PROCAFE receives the full support of the Coffee Sector and the full funding as designed, some of the more important considerations for future actions are

1 The need for a permanent residence for the Administration and Laboratory Units is urgent Consideration of a site other than the one near Ateos seems prudent, building on the Coffee Plantation recently acquired as a research station would seem an improvement

2 Greater attention should be given to influencing coffee processing in El Salvador It is important that in the least possible time, as much of the negative environmental impact as possible be eliminated from the processing activity In the very near future there will be pressures to do so PROCAFE should immediately provide a model for such a facility on its Research Station

3 PROCAFE has successfully developed an efficient artificial diet for the reproduction of the coffee berry borer in the laboratory This should be exploited by patenting the diet, using it aggressively in its program of "Control Biologico de la Broca", and for licensing abroad if requested

4 Emphasis must be given to micro-economic studies on a full time basis PROCAFE's economists have continuously been diverted from economic studies by demands for planning and forecasting activities In order to produce benefits for the coffee growers, economic studies must be engaged both with what the extensionists are recommending to farmers and what the researchers are designing for the future

5 PROCAFE initiated a very successful Small Farmer Group Assistance Program This program has great value and should be continued Some will argue that the effect these small farmers have in overall production is minimal, although this is mostly true with respect to bags of

coffee, the real value is the social impact in helping the small holder to improve his situation. At the same time he remains a source of labor in peak seasons.

6 With respect to PROCAFE maintaining a high level of performance, it is important there be a program that continually strives to elevate the level of preparation of the staff. This applies particularly to the research staff, at present there are no PhDs on the staff, but they have been receiving temporary support from outside. Having a PhD does not guarantee that an individual will do better work than someone with a lesser degree, but having two or three PhDs will ensure that the latest scientific knowledge and methods are reaching the Institution. There must be a continual infusion of ideas from outside if the level of performance is to be maintained. The best way to obtain that infusion is by sending selected staff members for training abroad.

ANNEX I
Soil Fertility Report, Dr. Marcos Pavan

INTRODUCTION

I am a soil researcher. For 20 years I gained experience in research in the Instituto Agronomico do Parana (IAPAR), Brazil. For the past 10 years I have been a senior research scientist in the area of Soil Science in this governmental research organization IAPAR. If any of the observation I shall make about the problems of conducting research in acid soils are help to you, I will be pleased. I would rate my stay in El Salvador as the best experience I have had in my professional career.

The activities pursued were the following

- 1 Presented seminars to Agronomists and Coffee Growers
- 2 Trained PROCAFE Staff on soil fertility and coffee nutrition
- 3 Conducted research in the area of soil fertility
- 4 Worked with PROCAFE Staff of the Department of "Sistemas de Produccion" on procedures used for soil research and how to perform analytical work in soils and communicate the results

These activities will be illustrated in details in the present report

SEMINARS

A series of seminars was presented to local agronomist and growers on how to manage soil fertility for coffee production

Summary of seminars

Date	Local
April 25, 1996	Commercial Center of Loma Linda, San Salvador
May 18, 1996	Beneficio los Reyes, Juayua
May 25, 1996	Finca Montebello, Santiago de Maria
June 7, 1996	Asociacion Cafetalera de El Salvador, Santa Ana

TRAINING

A series of short-courses for practical training in soil fertility and Coffee nutrition was offered during May and June, 1996 to selected researchers. Illustrated materials were provided in Spanish to each student

I ION ABSORPTION AND TRANSPORT BY PLANTS

Topics of the course

1- Introduction characteristics of ion absorption by plant-roots Selective accumulation of ions by plants

2- A review

2 1 Soil solution composition

2 2 Plant roots structure and morphology

2 3 Plant cell components, composition and structure of cell wall and plasmamembrane
The Davison & Daniell model

2 4 Rhizosphere

2 5 Ion movement in Soil diffusion, mass flow, and root interception

3- Ion Transport by Plants Energy independent

3 1 Diffusion Ficks law

3 2 Donnan Equilibrium

4- Ion Transporte by Plants Energy dependent

4 1 Chemical potential Nernst equation

4 2 Characteristics oxygen, temperature, pH, Vitts effect, microorganisms, etc

4 3 Ion transport across membranes

- 5 Mechanisms of Ion transport
 - 5 1 Transport from soil solution to roots
 - 5 2 Transport in the root cells (up to endoderm)
 - 5 3 Transport from the root cells (endoderm) to leaves and fruit through xylem
 - 5 4 Transport through floem (redistribution)
- 6- Mobility of ions in the plant

II METHODOLOGY USED IN LABORATORY AND GREENHOUSE TO STUDY SOIL FERTILITY

Topics of the course

- 1 Soil incubation with lime materials to determine lime requirement (LR) for coffee soils
- 2 Soil incubation with organic materials (coffee pulpa, plant residues, manures, etc) to determine the effect on soil reaction and mineralization rates
- 3 Soil incubation with inorganic fertilizers to determine how the fertilizers reacts and moves in soil
- 4 Determination of adsorption capacity of soils for phosphorus, potassium, copper, zinc, and boron
- 5 Soil columns technics used to set up PVC Soil Columns to study lime movements and reactions in soils Technics used to speed up lime movement in soil Analysis of drainage water for environmental studies
- 6 Determination of nitrogen mineralization rates amonification, nitrification, volatilization, denitrification, and leaching
- 7 Soil pot studies coffee seedling responses to soil applied amendments
- 8 Nutrient solution culture (soilless culture) for plant nutrition study, nutrient deficiency and toxicity How to make a nutrient solution and management (nutrient composition, pH, ionic strength, etc)

III ORGANIC FERTILIZATION

Topics of the course

- 1 Principles
- 2 Organic material composition
- 3 Organic material analysis and interpretation of chemical analysis
- 4 Organic material decomposition rate C/N ratio
- 5 Organic material reaction in acid soil
- 6 Organic metal complexation Chelation, Aluminum Organic complexes
- 7 Organic material mangement rates, time, and type of application
- 8 Management of organic coffee recommendation of organic materials, adjusting with the N, P, K requirements of coffee

IV BIOLOGICAL METHODS TO EVALUATE SOIL FERTILITY

Topics of the course

- 1 Principle of biological methods used in soil science
- 2 What is indicator plants to detect soil unfertility?
- 3 Biological method to diagnose soil acidity problem and to determine lime requirement
- 4 Biological method to determine phosphorus requirement
- 5 Biological method to determine potassium requirement
- 6 Use of weed plants as indicator of micronutrient (Cu, Mn, Fe, Zn, and B) requirements
- 7 Methodology to calibrate indicator plants with coffee response

RESEARCH

1 REDUCTION OF SUBSURFACE ACIDITY WITH SURFACE APPLIED LIME AND GYPSUM

Subsoil acidity with low calcium content and often toxic levels of aluminum severely affect coffee-root development in many salvadorian soils. A greenhouse experiment was carried out with PVC columns (60cm high by 15 cm diameter) of a disturbed coffee soil that had sufficient subsoil acidity to restrict root growth. The objective was to determine the effects of surface applied $\text{CaMg}(\text{CO}_3)_2$ (dolomite) and CaSO_4 (gypsum) on soil pH and exchangeable Ca, Mg, K, and Al. Soil columns were treated with dolomite pH 5.0 and 6.0, gypsum or 2/3 dolomite pH 5.5 + 1/3 gypsum rates. The irrigation treatment consisted of trickle irrigation applied at 600 ml per week for 5 months, equivalent to 1779mm rainfall per year. Tables 1, 2, 3, 4, 5, and 6 presents the results on soil pH, exchangeable Ca, Mg, K, and Al, and cation exchange capacity (CEC) in the soil profile. Effect of dolomite treatments were observed in the upper 10 cm of the profile. Dolomite increased soil pH, exchangeable Ca and Mg, CEC while decreasing exchangeable K and Al. Gypsum treatment reduced the level of exchangeable Al while increasing the level of exchangeable Ca throughout the 60 cm depth profiles. Soil pH was less affected by gypsum. Based on the effectiveness of gypsum in reducing exchangeable Al while increasing exchangeable Ca deeper in the soil profile and the effect of dolomite lime in the upper part of the profiles, the combination of dolomite lime and gypsum appears to be an appropriate amendment treatment for Salvadorian Coffee Soils with concentrations of available Al.

TABLE 1 Effect of surface applied dolomite and gypsum on soil pH (Finca Ochupltan, Santa Ana)

Soil depth(cm)	Control	Dolomite pH 5.0	Dolomite pH5.5	Dolomite pH6.0	Gypsum	Dolom pH5.5+ Gypsum
0-5	4.3	6.1	6.4	6.6	4.8	6.2
5-10	4.2	5.7	5.6	5.8	4.3	5.4
10-20	4.1	5.1	4.8	5.0	4.3	5.0
20-40	4.4	5.3	4.8	5.0	4.4	4.9
40-60	4.4	5.4	5.6	5.0	4.8	5.2

TABLE 2 Effect of surface applied dolomite and gypsum on exchangeable Ca (Meg/100g)
Finca Ochupltan, Santa Ana

Soil depth(cm)	Control	Dolomite pH 5 0	Dolomite pH5 5	Dolomite pH6 0	Gypsum	Dolom pH5 5 + gypsum
0-5	1 82	9 15	11 12	12 37	34 30	25 80
5-10	1 42	6 05	5 55	6 52	14 80	9 77
10-20	1 40	4 37	3 87	2 97	10 60	7 95
20-40	2 73	4 67	3 47	3 97	7 97	6 20
40-60	3 27	5 47	5 70	5 75	12 10	6 45

TABLE 3 Effect of surface applied dolomite and gypsum on exchangeable Mg (Meg/100g)
Finca Ochupltan, Santa Ana

Soil depth(cm)	Control	Dolomite pH 5 0	Dolomite pH5 5	Dolomite pH6 0	Gypsum	Dolom pH5 5 + gypsum
0-5	0 23	2 36	2 43	2 51	0 59	1 31
5-10	0 15	1 66	1 47	1 62	0 21	0 96
10-20	0 14	1 24	0 81	0 75	0 19	0 73
20-40	0 30	1 11	0 64	0 75	0 22	0 65
40-60	0 47	1 20	1 40	1 31	0 87	1 08

TABLE 4 Effect of surface applied dolomite and gypsum on exchangeable K (meg/100g)
Finca Ochupltan, Santa Ana

Soil depth(cm)	Control	Dolomite pH 5 0	Dolomite pH5 5	Dolomite pH6 0	Gypsum	Dolom pH5 5 + gypsum
0-5	0 19	0 11	0 06	0 04	0 10	0 05
5-10	0 25	0 15	0 16	0 10	0 14	0 14
10-20	0 28	0 22	0 23	0 18	0 17	0 22
20-40	0 30	0 22	0 27	0 18	0 20	0 30
40-60	0 20	0 20	0 19	0 19	0 18	0 22

TABLE 5 Effect of surface applied dolomite and gypsum on exchangeable Al (meg/100g) Finca Ochupltan, Santa Ana

Soil depth(cm)	Control	Dolomite pH 5 0	Dolomite pH5 5	Dolomite pH6 0	Gypsum	Dolom pH5 5 + gypsum
0-5	2 95	0 42	0 38	0 33	1 97	0 31
5-10	3 70	1 00	1 02	0 58	3 00	1 08
10-20	3 52	1 65	2 07	2 15	3 47	1 55
20-40	2 63	1 35	1 95	1 82	2 90	1 77
40-60	1 97	0 87	0 70	0 81	1 37	1 02

TABLE 6 Effect of surface applied dolomite and gypsum on effective cation exchange capacity (meg/100g) Finca Ochupltan, Santa Ana

Soil depth(cm)	Control	Dolomite pH 5 0	Dolomite pH5 5	Dolomite pH6 0	Gypsum	Dolom pH5 5 + gypsum
0-5	5 19	12 04	13 99	15 25	36 96	27 47
5-10	5 52	8 86	8 20	8 82	18 15	11 95
10-20	5 34	7 48	6 98	6 05	14 43	10 45
20-40	5 96	7 35	6 33	6 72	11 29	8 92
40-60	5 91	7 74	7 99	8 06	14 52	8 77

TABLE 7 Effect of surface applied dolomite and gypsum on available S-SO₄ (ppm) Finca Ochupltan, Santa Ana

Soil depth(cm)	Control	Dolomite pH 5 0	Dolomite pH5 5	Dolomite pH6 0	Gypsum	Dolom pH5 5 + gypsum
0-5	89	227	203	261	1536	906
5-10	106	193	190	303	1348	735
10-20	116	214	181	311	1043	573
20-40	138	239	190	288	702	508
40-60	162	219	247	343	746	465

2 FIELD RESPONSE OF COFFEE TO DOLOMITE LIME AND GYPSUM

This study was started in January 1994 at Cooperativa El Chorro, San Juan Opico, La Libertad, to evaluate the effect of dolomite lime and gypsum on coffee yield. In the Report of December 1995 I presented the results for 94/95 harvesting. In the present report it is presented the effect of treatments on coffee yields of 94/95 and 95/96 harvest (Table 8). Based on two years data, dolomite treatments increased yields. The best treatment was dolomite 42 oz/pl, corresponding an increase of 26% of yields (clean coffee). The best combination of dolomite and gypsum was half of the dolomite requirement plus half of the gypsum requirement, corresponding an increase of 21% of yields.

Implications of these studies with acid coffee soils

Soil acidification is a natural process resulting in the leaching of soluble cations such as calcium (Ca), magnesium (Mg), and potassium (K) from upper layers of the soil and their replacement on the exchange sites by hydrogen (H) and aluminum (Al). This process is accelerated by agriculture practices, including the addition of certain nitrogenous fertilizers. High rates of ammonia-based fertilizer can cause acidification to considerable depth and prolonged use can lead to acidification of subsoil. I consider that the use of ammonia-based fertilizer is the main cause of acidification of Salvadorian coffee soils.

Low soil pH affects the biological cycling of nutrients and their availability to plants and increases the levels of soluble Al and manganese (Mn). Soluble Al is toxic to coffee roots and limits access to soil water and nutrients. Consequently, coffee yield output is affected and poor coffee growth may lead to soil loss through water erosion.

Our results showed that coffee soils can become acid and that the remedy is to apply lime. Lime raises the pH, thus decreasing soluble Al and increasing the availability of nutrients. Lime also corrects Ca deficiency and dolomite lime supplies Mg as well. The manipulation of pH in surface soils is technically straight forward by surface applied lime materials (calcite, dolomite, hydroxide, oxide, etc.), but correcting acidity in the subsurface is more difficult because of the slow movement of the effect of lime down the profile. Deep incorporation of lime using specialized equipment has proved to be unpractical for established coffee plantation. Reports of the amelioration of subsoil acidity through the use of CaSO_4 (gypsum) have stimulated interest in possible use of this product. Gypsum is mined in Guatemala and is available in El Salvador marketing. Our results demonstrated the efficiency of dolomite lime and gypsum in ameliorating surface and subsurface acidity and in increasing coffee yields in El Salvador.

Practical strategies for amelioration of soil acidity are now available. Continued liming of top soils over a long period of time, sufficient excess of alkaline is capable of moving down (0-20cm) the profile to neutralize acidity. Gypsum, applied on the soil surface has proven to be an ameliorant which is highly efficient in reducing the deleterious effects of subsoil acidity on root growth and coffee yields. When the gypsum front reaches the subsoil, amelioration is due to the increased supply of Ca and the reduction in Al by a number of mechanisms. To obtain maximum benefit from both amendments, a combined application of gypsum with dolomite is recommended for Salvadorian coffee soils.

TABLE 8 Effects of surface applied dolomite lime and gypsum on coffee yields at Cooperative El Chorro, San Juan Opico, La Libertad

Treatments	Coffee Yields qq-oro/mz			
	94/95	95/96	Means	%
Control	84	79	82	100
Dolomite 32 oz/tree	101	84	93	113
Dolomite 42 oz/tree	122	84	103	126
Dolomite 52 oz/tree	82	80	81	99
Dolomite 62 oz/tree	110	77	93	114
Gypsum 62 oz/tree	90	74	82	100
1/2 Dolom + 1/2 Gypsum	96	102	99	121
2/3 Dolom + 1/3 Gypsum	82	73	77	95
1/3 Dolom + 2/3 Gypsum	90	60	75	92

RECOMMENDATIONS OF RESEARCH PRIORITIES IN SOIL FERTILITY

1 Soil testing for predicting fertilizer and lime requirements Analyzing soils regularly for plant available nutrients is the only means of watching and correcting changes in soil fertility. More specific methods of soil testing are needed, especially for high-yielding coffee farming. PROCAFE should improve the soil testing to quantify the effectively available nutrient in the soil, how quickly does this quantity change during flowering, fruit growth, leaves and branches growth, fruit maturation, etc., as a result of nutrient uptake, nutrient losses on nutrient immobilization. Also is important to identify how much fertilizer is required for different coffee cultivars (Catuai, Pacas, Bourbon, Pacamara, Icatu, Catimor, etc.) at different altitude (low, medium, and high) to raise and maintain the productivity level of a soil for maximum return upon input made.

Much attention must be devoted to the soil surface chemistry. The quantity of negative charge of soil knowing as cation exchange capacity-CEC) is a most important parameter for the evaluation of the productivity potential of a soil with variable charge, for its nutrient supply rates and for its fertilizer and lime requirements. Therefore, emphasis should be placed on surface charge characteristics of the coffee soils to better understand the fertility and recommendations of lime and fertilizers. Although the link between exchangeable acidity and Al toxicity appears to be indirect, we need to be clear about the role of surface charge in Al retention because of the importance of this reservoir of acidity in the soil system, and its great influence on the amount of total Al in the soil solution. Also, because basic cations are demonstrably lacking in many coffee soils, we should be clear about the ability of soils to retain exchangeable basic cations (Ca, Mg and K), and the most appropriate ways to strengthen this ability.

2 The Management of Acid Coffee Soils based on my experience in El Salvador, the large effects on coffee yields are caused by differences in coffee cultivars tolerance to acidity, in subsoil acidity levels, and in the acid addition rate. Differences in the coffee cultivars demand for subsoil resources are also significant and the effectiveness of the ameliorant in neutralizing subsoil acidity is an important variable. Coffee tolerance to acidity is useful to increase yields on these very acid Salvadorian soils, to change the cost/price ratio to values more favorable for amelioration, to utilize the water and nitrogen resources of acid subsoils, to decrease acid addition by reducing nitrate leaching, and to diversify types of production on acid soils. It is recommended to conduct studies on the tolerance to acidity of rootstock from different coffee species. Means of managing acid soils include lime materials, organic compounds, ameliorants with different leaching characteristics (gypsum, calcium nitrate, etc) utilizing root excretion of bicarbonate in response to manipulation of nitrate leaching and uptake. Acid addition rates must be reduced by using less acidifying nitrogen fertilizer, by closely matching supply with plant demand for nitrogen thus minimizing nitrate leaching, and by managing the ecosystem to minimize the export of organic anions. It is recommended evaluation of organic materials (pulpa, manures, plant residues, etc) to accelerate the mobility of surface applied lime. The formation of metal-organic complexes is assumed to be responsible for the movement of Ca and Mg in the soil profile. Also, it is recommended to continue the study on use of pulpa as soil ameliorant.

It is emphasized that the simple technology of liming to a soil pH at which maximum coffee yields occur is an inadequate prescription for managing acid soils. A broad view of the many management options should be taken.

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NOTE These references are available in the Library

ANNEX II
Environmental Report, Dr. Francisco J. Artigas

Final Report
Francisco J Artigas
Environmental Advisor
Coffee Transfer of Technology Project
Contract # 519-0362-C-00-3172-00
IRI-USAID/PROCAFE

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1 - INTRODUCTION

After almost three years of working in this project I have been witness to many changes and progress in PROCAFE's organization and research. I arrived to PROCAFE on September of 1993 along with 9 other advisors from IRI and our chief of party Dr. Paul Duffield. As the environmental advisor I had the chance to get to know and work with some excellent people that made my experience in this project a very good one. My task was to oversee and organize all environmental aspects of project implementation. I was fortunate to always find support from my chief of party and PROCAFE's executive director and Board of Directors.

With all confidence I can say that we leave today in 1996 a better organization that we found in 1993. This change came about thanks to the hard work and dedication of all the local researchers, administrators, extensionists in PROCAFE, as well as the advisory team from IRI. Advisors and local researchers and extensionists worked hand to hand modernizing PROCAFE. This road to modernization was not an easy one for many of us that had to learn new ways of working and educate ourselves about new technologies. Now, we are seeing the positive results of this effort that will help extend PROCAFE's influence in the coffee industry well into the 21st century.

I am optimistic about PROCAFE's future. The technology that was transferred by this project in many cases was mastered very quickly and adopted by local researchers and technicians in a successful manner. Many technicians in PROCAFE had the chance to interact and learn from some of the best in their fields such as Dr. Jose Rutilio Quezada in biologic control, Dr. Larry Nelson in statistics, Dr. Marcos Pavan in soil fertility and Dr. Herculano Medina in coffee genetics to mention just a few. However, it was the quality of people at the receiving end of this program that made this project the success that we see today.

2 - TERMS OF REFERENCE

The environmental advisor will serve as the primary advisor to PROCAFE on environmental issues related to coffee production and processing. He will assist PROCAFE's environmental and soils research department head of staff. He should be able to assess current strengths and weaknesses of PROCAFE's personnel and its program in the area of the environment and recommend activities and training to develop the research capabilities of the department and its personnel. His duties will include

Advise the PROCAFE Executive Director, Board and COP on the environmental issues related to coffee production and processing

Advise the head of the PROCAFE Department of Natural resources and soils, especially regarding the proper management of and environmental research program

Assist PROCAFE to establish working relationships with public and private organizations with environmentally related interests

Assist PROCAFE to identify and quantify, to the extent possible, the type and level of environmental degradation caused by coffee production and processing

Assist PROCAFE to develop policies and standards related to sensitive environmental issues such as soil erosion, water quality degradation and pesticide use

Maintain a list of restricted pesticides and advise the PROCAFE and contractor staffs on regulations affecting the purchase and use of restricted pesticides, especially by a scientific organization

Working with PROCAFE staff, develop environmentally benign methods of coffee production and processing while maintaining an emphasis on the revenue needs of producers

Assist PROCAFE staff, especially extensionists, communications and training personnel, to incorporate environmental concerns into their public and professional programs of information dissemination

3 - WORK PLAN

The task of this long term assignment involved two aspects. First, to create and build an effective environmental unit with the best available technology for environmental monitoring and second, work with individual researchers and interdisciplinary teams on specific environmental research problems and introduce new concepts and methodologies to PROCAFE's researchers.

It was essential in the plan to create an environmental unit within PROCAFE that can monitor and evaluate change in the coffee growing landscape. This unit will capture and manipulate information such as the cadstral of coffee farms, land use, development, land measurements and weather conditions around the coffee areas and bring it about as a central geographical data base. The system is designed to capture any significant change in the coffee growing environment and is an ideal tool to measure project impact and progress. The plan involved the establishment of a Geographical Information System (GIS) for managing environmental information. This technology well utilized is a powerful tool for generation and transfer of technology.

The plan involved working with individuals and interdisciplinary groups on new environmentally oriented projects that were initially suggested in the Environmental Assessment Study (W. Williams 1992). Such projects included pesticides used in coffee, water quality monitoring studies, run off and infiltration studies, digital simulation models for coffee processing facilities, composting and agrometeorology. International experts were identified and brought in to share their professional expertise with local researchers. From this interaction, skills and methodologies are exchanged, research capability is built, and at the end a better quality product is generated.

Finally, the plan included the establishment of working relationships with public and private organizations with environmentally related interests such as The Instituto Geografico Nacional (IGN), Secretaria Nacional del Medio Ambiente (SEMA), Direccion Nacional de Economia Agropecuaria (DGEA), Salvanatura, Green Project, and others.

3 - SUMMARY OF MAIN ACHIEVEMENTS

3 1 - Establishment of a comprehensive service oriented geographical information system (GIS) in PROCAFE that evolved to become one the most advanced and profitable in the country. The system includes a vector and raster based GIS, global positioning system (GPS) and satellite image processing capability

3 2 - Design and implement a national coffee weather monitoring system that operates seven remote stations scattered around the coffee growing areas and are connected via cellular phone technology to a central information processing center

3 3 - Contribute to the publication of the Biodiversity Poster as part of a greater environmental awareness campaign organized by PROCAFE on behalf of the environment

3 4 - Contributed to the final agreements on inter-institutional cooperation between PROCAFE and DGEA, IGN, Salvanatura, ES Energia, and others

3 5 - Organization and implementation of a multi-seasonal water quality study of a high altitude tropical river which drains a coffee cultivated watershed

3 6 - Updating and maintaining PROCAFE's restricted pesticides data base for coffee

4 - LIST OF DOCUMENTS PRODUCED

May 1996 Conservation and biodiversity of the coffee forest

May 1996 Poster of coffee forest biodiversity

April 1996 Implementation of a GIS pilot project for an electric utility distribution system in El Salvador Constancy report

February 1996 Coffee soil fertility study based on four years of soil chemical analysis of coffee growing area samples 1992-1996 Internal document

September 1995 Geographical information Systems Technical Bulletin #3

October 1995 Project River El Molino Executive summary

October 1995 Desarrollo de un SIG en PROCAFE 1995-2000 Documento interno

May 1995 Inter-institutional cooperation agreement document between PROCAFE, The Direccion Nacional de Economia Agropecuaria and The Instituto Interamericano de Cooperacion para la Agricultura (IICA) Documento convenio

July 1995 The advantage of knowing where you stand ABCAFE Magazine

February 1995 Digital simulation model of water used in coffee processing facilities in El Salvador Internal research document

January 1995 Future perspective of the GIS system in PROCAFE Internal document

November 1994 PROCAFE's future GPS operations and needs Internal document

November 1994 The bamboo garden composter

August 1994 Loss of sediments and nutrients from coffee plantations in Volcano San Salvador Internal research document

April 1994 Guide to Pesticides used in coffee in El Salvador Internal document

March 1994 A diagnostic of foliar and soil analysis results from samples of coffee farms of El Salvador 1991-1993 Internal Document

January 1994 Action Plan environmental component PROCAFE document

November 1993 Moving towards a sustainable coffee farming PROCAFE's environmental five year strategic plan 1993-1997 Internal document

4 - RECOMMENDATIONS

4.1 The GIS has a chief, five technicians full time, and a secretary. This unit has achieved a satisfactory level of technical development, to the point of being profitable. The recommendation is not to fix anything if it's not broken. It would be good if "la gerencia" could see that an organizational meeting takes place every Monday in the GIS room in order to organize services being offered to clients.

4.2 An important investment or capital of the GIS are the trained technicians. PROCAFE's leadership in this technology will require commitments to continue to train this personnel and to keep competitive talents with competitive salaries in the growing information market of El Salvador.

4.3 The GIS hardware and software was the most advanced in 1993. In two more years there will be a need to update and upgrade hardware and software to remain competitive. A new plotter with laser technology will soon be needed to replace the old pen plotter. The question about moving to a UNIX operating system is important and should be part of a larger plan within PROCAFE that involves the "informatica department."

4.4 It is recommended that Beatriz Gertrudis Chavez be hired as full time staff. During the last six months she has received GIS and GPS training. The quality of her work speaks for itself, she should be hired as a GIS/GPS Technician.

4.5 Weather stations are operated by Ing. Saravia who collects, analyzes and distributes weather information and Ing. Hernandez who helps with maintenance of the measuring equipment in the field. The amount of information generated by the system is overwhelming for just one individual. It is recommended that PROCAFE assigns an extra "Ingeniero" who will collaborate generating specific

agrometeorology products and help redirect this activity to a self financing operation in the future

4.6 Technicians in the field of agroindustry are well trained and well equipped to offer services and technical advice in the areas of coffee processing and coffee quality control. It is recommended that PROCAFE reorganize this personnel in a way that they may operate more independently and attract new business following the GPS model. PROCAFE must not overlook this potential in the future.

ANNEX III

Extension Management Report, Dr. Rafael Ledesma Schoowe

IRI RESEARCH INSTITUTE

Rafael Ledesma Schoowe, Ph D
Extension Management Specialist/IRI
Transfer of Technology Project USAID/PROCAFE

CONSULTANCY FINAL REPORT

San Salvador, El Salvador, June, 1996

SUMMARY OF MAIN ACCOMPLISHMENTS

1 Review the Strategic Plan - 1992-1997, in relation to the capacity of the transfer of technology unit to implement this plan Analyze each component and provide adequate recommendations to our actual situation

Results

Analysis and recommendations provided, strategic plan revised, actualized and edited Document prepared

2 Preparation of the consultant's Plan of Work - 1993-1997

Results

Plan of Work prepared, edited and approved by PROCAFE The plan consisted mainly of the general objectives of the consultancy, the specific objectives to attain, the strategies and the main activities to be performed by the consultant from September 1993 to July 1996 Document prepared

3 Preparation of the Plan of Work for the transfer of technology division for 1994, 1995 and 1996 Documents prepared

4 Organization of the transfer of technology department in order to implement an effective system of technology transfer

Results

The department with its three units and 17 offices in the country has been organized to attain better integration of offices and regions Computerization, standardization and codification of the documents and reports were established Documents prepared for these activities

5 Training of Extensionists on Coffee Production and Transfer of Technology Methodology

Results

- a) The 48 extensionists in the field received approximately 80 days of training in different aspects of coffee and extension methodologies in the country Manuals, summary of training in different aspects of coffee and extension methodologies in El Salvador
- b) Three (3) extensionists were sent to Puerto Rico and Mexico to obtain their Masters degree in extension related areas
- c) Forty five (45) extensionists visited several countries (Honduras, Guatemala, Costa Rica, Nicaragua, Mexico, Colombia, Texas and Florida) learning about the extension work in these countries (on the job training)

6 Assisted in the training of coffee producers

Results

- a) Preparation of teaching materials
- b) Teaching methodologies developed and implemented
- c) Approximately 15,000 coffee producers, including 2,915 women, trained in modern production technologies with 664 training activities Documents and reports prepared

7 Development and incorporation of transfer of technology methods to reach small and unaffiliated farmers to implement this methodology

Results

- a) Development and implementation of a practical and simple methodology of working with small coffee producers
 - Actually 118 groups of small coffee producers organized
 - 1250 small coffee producers are members of these groups
 - 118 groups with nurseries of coffee with 1,050,000 plants established
 - 70 demonstration plots established and reports prepared of all activities

b) Development and implementation of a methodology of working with medium and large sized coffee producers

- Actually 9,906 coffee producers (large and medium) assisted
- 43,750 mz of coffee under direct technical assistance Report prepared

c) Development of a system of visits to reach unaffiliated and hard to reach farmers

- Actually 20,831 visits to farmers by the extensionist Reports prepared

d) Development of Guidelines for the organization of "Local Coffee Committees" to support the work of PROCAFE in their communities Actually, two (2) pilot committees working in Santa Ana (Reg I) and Guadeloupe (Reg II)

8 Assisted in the selection and management of short and long-term consultants in my area

Results

Approximately 50 weeks of short-term consultants in my area

9 Assisted the communications unit in the development and implementation of a promotional plan

Results

Prepared materials for internal and external use by PROCAFE personnel and by coffee producers, radio, TV, newspapers, etc

10 Assisted in the development of a credit program for small coffee producers

Results

A program was established with IDB, UCAFES and seven small coffee cooperatives to provide credit management

11 Organization of the unit for the preparation of educational modules

Results

Training of the personnel and acquisition of the equipment for the unit

Five modules on soil fertilization and coffee management already prepared

12 Assistant Team Leader on two occasions, providing the administrative and technical leadership to IRI consultants, team and the management and coordination of the USAID/IRI contract

List of Documents Prepared and Coordinated by the Consultant on Extension Management

- 1 Strategic plan for the Transfer of Technology Division, 1993-1997
- 2 Consultant plan of work, 1993-1997
- 3 Plan of action for the Transfer of Technology Division for 1994, 1995 and 1996
- 4 Transfer of Technology Division monthly reports - Jan 1994 to June 1995 (30 reports)
- 5 Strategic for Transferring Modern Coffee Technology to small coffee producers, 1993
- 6 Workshop on Interpretation of Soil Analysis Samples, Feb 1994
- 7 Workshop on Planning, Monitoring, Evaluating and Establishing Goals in Extension, Jan 1994
- 8 Determination of training needs by the coffee extensionist of PROCAFE, Nov 1993
- 9 Workshop on Methodologies for Organizing Groups of Small Coffee Producers, Dec 1993
- 10 Workshop on Fundamental Aspects for Transferring Modern Technologies for Coffee Production
- 11 Modular short courses for farm administrators, Feb 1994
- 12 Modular short courses on Systems of Management of Coffee Plantations March 1994
- 13 Workshop on Integrating Research and Extension March 1994, April 1995 and Feb 1996
- 14 The Validation of Technology for Maximum Results in El Salvador March 1994

- 15 Transfer of Technology Audio-visual aids preparation
- 16 Training plan for 1994 Jan 1994
- 17 Methodologies for Transferring Technology in Coffee Feb 1995
- 18 Methodologies and Strategies of Working with Groups of Small Coffee Producers, Feb 1995
- 19 Groups Techniques for Working with Small Coffee Producers, Feb 1995
- 20 Plan of Work for Transfer of Technology Division for 1995
- 21 Organization, Function and Work Strategies for the Division of Technology Transfer for 1995 Feb 1995
- 22 Guideline for the Utilization and Facilitators in the Process of Transferring Technologies to Small Coffee Producers Feb 1995
- 23 Guidelines for the Organization of Municipal Committees of Coffee Producers to Advise and Promote the Work of PROCAFE
- 24 Guidelines for the Validation of Technology in PROCAFE Feb 1995
- 25 Guidelines for the Organization of Managerial Information and Reporting for Division of Technology Transfer, Feb 1995
- 26 Summary in Table and Graphics of the Activities Performed by the Division of Technology Transfer during 1994 Jan 1995
- 27 Technologies Recommended for the Production of Coffee when the Prices are Good Feb 1995
- 28 Project for the Production of Coffee Nurseries with Groups of Small Producers, 1995
- 29 Project for the Establishment of Demonstration Plots with Groups of Small Farmers
- 30 Nominal Group Techniques March 1995
- 31 Training needs for Extensionists Working with Small Farmers Nov 1994
- 32 Group Processes, Training Module, June 1996
- 33 Leadership Training Module June 1996
- 34 Participation Planning with Groups of Small Coffee Producers June 1996
- 35 Soil Sampling Technical Document May 1996
- 36 Foliar Sampling Technical Document May 1996
- 37 Soils Amendment Technical Document May 1996
- 38 Soils Fertilization Technical Document May 1996

ANNEX IV

IPM/Technical Writing Report, Dr. Jose Rutilio Quezada

FUNDACION SALVADOREÑA PARA INVESTIGACIONES DEL CAFE
PROCAFE
DEPARTAMENTO DE COMUNICACIONES

**TECHNICAL WRITING ADVISORY
SEMESTER REPORT**

PRESENTED TO

DR PAUL C DUFFIELD
CHIEF OF PARTY IRI/PROCAFE

BY

JOSE RUTILIO QUEZADA *Jose R Quezada*
IPM AND TECHNICAL WRITING ADVISOR

DATE

MAY 30 1996

INTRODUCTION

The present report summarizes the activities carried out by the Advisor from January 1 to May 30 96 period which was mostly devoted to technical document writing and production although other tasks were undertaken in the areas of insect diagnosis training conferences and writing of essays. Since our contract ends on the 30th of June and as requested by the Chief of Party a document entitled PROCAFE YEAR 2000 is included in this report with some reflections about the Foundation its challenges and opportunities as the 21th century approaches.

Thanks are expressed to all PROCAFE personnel and management for facilitating our work throughout almost three years as well as for the trust and support of IRI the Chief of Party Dr Paul C Duffield who always supported and encouraged our job. The Communications Department's personnel provided a friendly atmosphere and cooperation that greatly facilitated our editorial endeavours.

ACTIVITIES

Although technical writing was the main activity during this final semester support was also provided to the areas of plant protection and training as follows:

A Diagnoses

- 1 Turbelaria associated to earthworm cultures
- 2 Beetles in stored dry coffee beans (Salvadorean Coffee Council)
- 3 Parasitoids on caterpillars infesting ornamentals (private nursery)
- 4 Coffee fruit borers infesting cashew nuts

- Cronology of Coffee Culture (Jan- april No 1)
- Cronology of Coffee Culture (May-Aug No 2)
- Cronology of Coffee Culture (Sept-Dec No 3)
- Windbreaks in Coffee Plantation (No 4)
- Nematodes Biology and control (No 5)
- Root Black Rot (Rosellinia) (No 6)

2 Technical Booklets

- Agrometeorology (No 2)
- Soil sampling for analysis (No 3)
- Leaf sampling for analysis (No 4)

3 Coffee Culture Poster

This artistic undertaking received my support in these areas

- Concept and vision of the Poster
- Elements of flora and fauna to be represented
- Writing essay to present the Poster
- Elaboration of table with classification of organisms
- Detail progress monitoring
- Consulting with knowledgeable individuals on details of Poster

4 Coffee Culture Manual

Production of this book was initiated by the end of 1995 with the following steps

- Interviews with technicians and administrators on general objectives and details of the Manual to secure cooperation
- Gathering and review of manuscripts then back to authors
- Other corrections
- Illustrations captions
- Correction of galley proofs
- Work with printing company for details last minute corrections etc

I also contributed one chapter to the Manual entitled "Beneficial Organisms in the Coffee Plantation" Total number of chapters was 20 and I also wrote the presentation of the Manual (a preface)

FINAL CONSIDERATIONS

As an addendum I am presenting an essay on "PROCAFE YEAR 2000" which may provide an input in planning discussions for the future of PROCAFE as an institution facing the challenges and opportunities of the next century

- 5 Lacebugs infesting castor bean plants
- 6 Beetle larvae boring ornamental trees

B Meetings

- 1 Workshop on Interaction between Generation and Transfer of Technology (1 day)
- 2 Advising CEL (National Hydroelectric Commision) on possibilities of applying biological control to water hyacinth on water bodies
- 3 Earth Day Conference (Hotel Presidente April 22 and 23)

C Conferences

Presented in PROCAFE regional offices

- 1 Quezaltepeque Feb 29 Ecology and Coffee Culture - 45 Coffee grower
- 2 Ciudad Barrios April 30 Pesticide Impact on Coffee Culture - 25 Coffee growers

D Interviews

- 1 Radio Sonora March 20 Half hour interview on Biological Control and Integrated Management of Coffee Fruit Borer

E Training Courses

- 1 Workshop on Ecology and Biodiversity Offered to 24 PROCAFE extension workers from all three coffee regions of El Salvador (Jointly with Dr Francisco Artigas)

F Essays Written

- 1 "Coffee Ecological Salvation of El Salvador 3p
- 2 "The Need to preserve the coffee plantation text for coffee culture Poster 2p
- 3 Workshop on Biodiversity and conservation of the environment (with F Artigas) 105p
- 4 Impact of Pesticides on Coffee Culture 11p
- 5 Coffe Culture Poster Clasification of animals and Plants 11p

G Technical Writing

- 1 Technical Bulletins

The 1995 series was completed with the following 8-page bulletins

- Geographical Information Services (No 3)
- Soil Insects Biology and Control (No 4)
- Integrated Management of Coffee Rust (No 5)
- Know and Manage Weeds (No 6)

Six more bulletins for 1996 were published or ready for publication

PROCAFE : YEAR 2000

JOSE RUTILIO QUEZADA
IPM ADVISOR IRI/PROCAFE

After about three years of serving as Integrated Pest Management Advisor for the IRI/PROCAFE Project, time in which I also acted as Advisor for the Communications Department in the area of Technical Writing I would like to present a few personal reflections on how I visualize PROCAFE by the year 2000 and beyond. I do not pretend to make a list of recommendations but instead offer my input to a vision to the future within the framework of the changing circumstances of a world in a process of globalization.

1 PROCAFE will have a protagonic role in the restoration of natural resources and environmental quality

In no country in the world coffee culture represents a haven for the flora and fauna as it does in El Salvador. The coffee ecosystem also preserves fertile volcanic soils, feeds the aquifers, and purifies the air as well. The ecological services performed by coffee culture are not known nor appreciated in their entirety.

The need to face the ecological crisis of the country will make both the public and private sectors look for the right answers. PROCAFE, through development and transfer of new technologies encompassed within the ecological preoccupations, will be capable to make substantial contributions to the efforts of biodiversity conservation, reforestation, agricultural diversification, sustainable wood and lumber production, ecotourism, conservation of aquifers and water bodies, and so on.

The recent acquisition of the finca "San Antonio" can provide the opportunity for PROCAFE to organize its activities on the farm to undertake research projects on coffee culture management focussed on environmental issues, such as

- a) Biologically Intensive Integrated Pest Management (native or imported beneficial organisms)
 - a 1 Intensive use of predators, parasitoids and entomopathogens
 - a 2 Use of antagonic fungi (such as *Tnchoderma*)
 - a 3 Use of plant and animal extracts (Neem, crustacean carapaces)
 - a 4 Use of cover crops (native or exotic as *Arachis*)
 - a 5 Grafting

a 6 Intensive use of biotechnology, tissue culture, etc

a 7 Organic coffee production

b) Gourmet Coffee

c) Experimental Ecological Coffee Mill

d) Watershed management

e) Set aside 10% of farm as Biological Reserve

f) Use of reserve to rescue plant germplasm, either disperse or in danger of extinction (Fruit, lumber, medicinal, etc) Establishing seed banks and live collections

g) Diversification plots, including model fuelwood production plots

This farm will also be an important training center for both technicians and the public, in order to contribute to development of an ecological awareness. Its facilities will be adapted in a way to constitute an important stop for "ecotourism" due to its cultural and biological interest, all of which will position PROCAFE among the leading environmental conservation institutions

2 PROCAFE will be self sufficient to carry on and expand its activities in a sustainable way by

a) Offering technical training courses to agricultural firms, both national and regional

b) Increasing the volume and quality of its technological products, such as certified seed, seedlings, grafted plants, parasitoids, entomopathogens, etc

c) Collecting funds from "ecotourism" visitors

d) Selling high quality technical publications on coffee culture subjects

e) Increasing volume and quality of soil and leaf analyses

f) Expanding geographical information (SIG) services

g) Presenting environmental restoration projects (water quality, biodiversity, soil conservation, etc) to secure funds from interested donating agencies

3 PROCAFE will be serving the community through

- a) Expansion of its communication programs in newspapers, radio and television, as well as the production of technical documents
- b) Participation in campaigns involving children and youth in environmentally related events
- c) Active participation in environmental programs, promoting coffee culture as the last bastion for the preservation of flora, fauna, and other natural resources in the country
- d) Fostering these projects carried out by university students to increase knowledge on environmentally related coffee problems
- e) Establishing cooperation links with governmental and non-governmental (ONG'S) entities, both national and international, preoccupied about the environment (reforestation, biodiversity, etc)
- f) Carry out or foster integrated education programs with the communities adjacent to "Finca San Antonio"

The environmental future of El Salvador is critically linked to the survival of coffee culture because of the unique ecological benefits of this agroecosystem, the survival of coffee culture, in turn, is closely linked to a highly technified, imaginative and creative PROCAFE in a position of leadership in the conservation, augmentation and sustainable use of natural resources in El Salvador .